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ABSTRACT

This multidisciplinary, progressional unit involves students in discovering wetlands and why such areas are important, and in learning they can make a difference in saving wetlands. The unit is designed to be taught with two options: (1) entirely in the classroom; and (2) a combination of classroom and field experience. Fourteen classroom lessons focus on wetland identification; wetland functions; wetland biodiversity; wetland values, attitudes, and issues; human impact on wetlands; wetland laws and regulations; and wetland actions. Each lesson plan contains information on purpose, method, concept, objectives, subjects, skills, materials, glossary words, time considerations, background, procedure, and worksheets. Seven field component activities emphasize the topics of student awareness and observational skills, diversity of wetlands, "hands on" experiential study of wetland ecology, biological adaptations to marsh life, inter-connectedness of wetland organisms, responsible wildlife management tools, and positive outdoor education experiences. A glossary is followed by resource lists containing 64 books, 14 teaching guides, and 10 audiovisual aids. (LZ)

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WETLAND UNDERSTANDING LEADING TO PROTECTION

A Comprehensive, Multidisciplinary Wetlands Unit for Middle Schools

OUTDOOR SKILLS CENTER

Financial Assistance Provided By:
WI Coastal Management Program, State of Wisconsin, Department of Administration, Division of Energy & Intergovernmental Relations, and Coastal Zone Mgt. Act of 1972, as Amended. Administered by Office of Ocean and Coastal Resources Mgt., National Oceanic & Atmospheric Administration.

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LEADING TO PROTECTION

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The Wisconsin Coastal Management Program, part of the WI Department of Administration and overseen by the Wisconsin Coastal Management Council, was established in 1978 to preserve, protect, and manage the resources of the Lake Michigan and Lake Superior coastline for this and future generations.

OUR WETLAND LEGACY

Early explorers referred to the Wisconsin Territory as "the Great Swamp". One-fourth (10 million acres) of this wild and pristine land was covered with wetlands. This rich ecosystem provided a host of benefits to the early inhabitants. Native Americans relied heavily on the bounty of these areas.

The first settlers, however, didn't recognize the value of wetlands. Wetlands were considered nuisances, neither plowable or navigable. They were considered as health risks:

> *"If there is any fact which is known by everybody and therefore the courts, it is that swamps and stagnant waters are the cause of malaria and malignant fevers, and that the public power is never more legitimately exercised than removing such nuisances."* **Swampland Act of 1850**

And remove them they did. In less than 150 years, 47% of the wetlands in Wisconsin were drained or filled. Nationally, less than 50% of our original wetlands remain.

WHY IS THE LOSS OF THESE "STAGNANT SWAMPS" IMPORTANT?

Wetlands are important water storage areas, especially during heavy spring rains. They release water slowly and thereby prevent flooding. They trap sediments that erode from upland areas. They filter chemicals and fertilizers out of the water, helping to insure both surface and ground water quality. Wetlands provide food, cover, and water for hundreds of species of wildlife and offer a tremendous recreation resource. **If you weren't aware before, wetlands are important.**

WHY PROJECT W.U.L.P.?

As we move into the 21st Century, development of wild areas in Wisconsin will confront wetlands time and time again. Our present laws and regulations don't protect all of our wetlands. Attempts to purchase wetland areas will save some, but many more will probably be lost, unless.....**Unless you get involved and help reverse this trend.**

Misconceptions, lack or understanding, and short sighted economics continue to contribute to the loss of wetlands. If we are to stop the destruction of our remaining few, we must go beyond the measures presently used. We must begin an educational campaign that will increase sensitivity to the diversity of wetland life, develop proper wetland values and attitudes, cultivate skills needed to resolve wetland problems, and motivate individuals into taking action to save wetlands. **If you haven't guessed it by now, your role as an educator is to help achieve these ends.** Project W.U.L.P. was designed as the tool to immerse your students into the wetland issue and motivate them to take action.

OH NO, NOT ANOTHER CURRICULUM!

You're right, it's not another curriculum. As we began to collect wetland materials from around the country, one thing became evident. Unless you were a "wetland junky", there was no way that you as a teacher would wade through all those activities and information to put together a meaningful unit.

So we did it for you. We spent months reading all the materials, picking out the important concepts, formulating a group of progressional activities, and field testing them, so you can pick it up and start teaching. Everything you need is in this multidisciplinary, progressional unit. Your students will take part in a true environmental education experience. Not only will they discover wetlands and why such areas are important, but also learn that they can make a difference in saving our remaining few.

Well now it's up to you. Only you can help reverse these trends in wetland loss. You have the power to give the decision makers of tomorrow , the necessary knowledge and skills needed to make sound decisions leading to positive actions. **We challenge you to put this unit to work in your classroom and help reverse this 150 year trend of misconception and destruction.**

PROJECT W.U.L.P. UNIT CONTENTS

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LESSON 2- WETLANDS ARE DIFFERENT--LIKE YOU AND ME (2 Periods).... 3
Using information sheets provided, students conduct research on common wetland types and develop a mural depicting each.

LESSON 3- WETLAND CARTOGRAPHY (1 Period).... 8
Using the topographical map provided, students will locate wetlands and answer questions on an accompanying worksheet.

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PROJECT WULP FIELD COMPONENT

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ACTIVITY 2- WETLAND SCAVENGERS (45 MIN.)..... 52
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ACTIVITY 4- A BEAVER WARDROBE (45 MIN.)..... 55
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MASTER MATERIAL LIST

Lesson One:

1) Flip-chart or butcher paper.

Lesson Two:

1) Student copies of Wetland Types Information Sheets.
2) Butcher paper or wide roll paper.
3) Materials for making a mural (colored paper, scissors, glue or tape, markers or crayons, etc.).

Lesson Three:

1) Copies of Topographical Map Worksheet
2) Extension: Copies of Local Topo Map or Wisconsin Wetland Inventory Maps.

Lesson Four:

1) Wetland Metaphor Box including: small pillow, sponge, bottle of antacid, baby bottle, bar of soap, vegetable strainer, and a rechargeable

Lesson Five:

1) Teacher copy of "Moonlight Madness".
2) Optional: Frog Songs- "Chorus of Spring Peepers"- audiotape.

Lesson Six:

1) Organism Research Questionnaire.
2) Tape, paper, crayons, or markers.
3) Black board or dry-erase board.

Lesson Seven:

1) Copies of Aquatic Key.
2) Collection equipment: nets, kitchen sieves, dish pans, ice cream pails, ice cube trays.

Lesson Eight:

1) Copies of Values Catagory Worksheet

Lesson Nine:

1) Copies of Boggsville- A Town Divided.
2) Copies of Issues Analysis Worksheet.
3) A black board, flip-chart, or dry-erase board.

Lesson Ten:

1) Copies of Wetland History Timeline Worksheet.
2) Copies of "When Push Comes to Shove".

Lesson Eleven:

1) Cut-outs of four Northern states, four sizes each.
2) Cut-outs of four Southern states, one size each.

Lesson Twelve:

1) Copies of "Legality Research Form" for each team.
2) Copies of "Simplified Wetlands Regulatory Handbook" for each student.
3) Copies of "Public Hearing Testimony Outline".
4) Copies of Personal Data Cards.

Lesson Thirteen:

1) Dry marker board, chalk board, or flip chart.

Lesson Fourteen:

1) Flip-chart or butcher paper.

PROJECT WULP FIELD COMPONENT

Activity One:

1) None.

Activity Two:

1) Copies of Wetland Scavenger Hunt Worksheet.
2) Pencils.

Activity Three:

1) Collection Equipment: nets, sieves, ice cream buckets.
2) Observation Equipment: dish pans, ice cube trays, microscopes.
3) Copies of Aquatic Invertebrate Key.

Activity Four:

1) Beaver Adaptation Costume: coat, goggles, nose plug, fins, paddle, oil, comb, axe, no tresspassing sign.

Activity Five:

1) None.

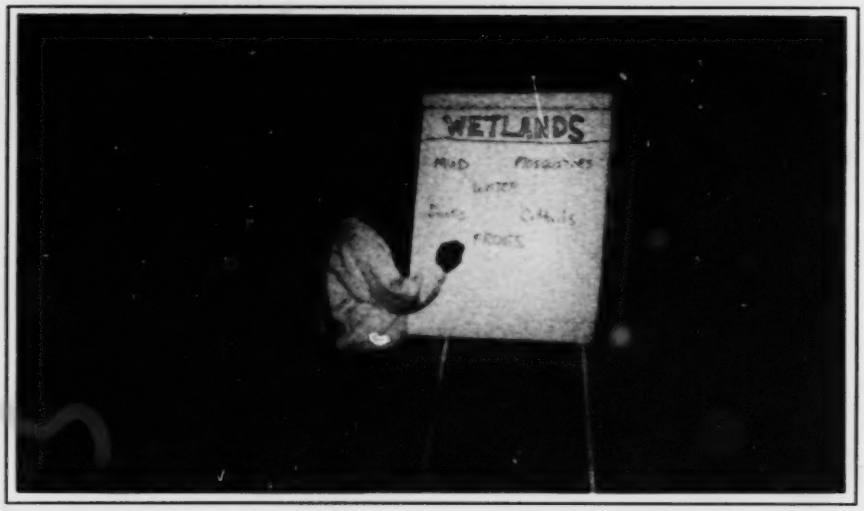
Activity Six:

1) Flip chart or dry marker board.

Activity Seven:

1) Flip chart or dry marker board.
2) Game pieces to be used as "tags".
3) Recording of Canada geese or goose call.
4) If possible examples of bird bands or tags.

WETLANDS --
"MORE THAN MUD AND SKEETERS"



PURPOSE

The purpose of this activity is to determine the student's pre-existing knowledge on wetlands.

METHOD

Students will brainstorm a list of wetland components and group them into like categories through the process of concept mapping.

CONCEPT

Wetlands are defined by presence of certain soils, vegetation, and water depth.

OBJECTIVES

The student will be able to: 1)list and associate components within a wetland, and 2) identify 3 factors used to define a wetland.

SUBJECTS

Language Arts, Science.

SKILLS

Classification, Listing

MATERIALS

***Flip-chart, or butcher paper**

GLOSSARY WORDS

Bog, Endangered Species, Hydrology, Marsh, Threatened Species, Wetlands, Wooded Swamp.

TIME CONSIDERATIONS

One 50 minute period.

BACKGROUND

Wetlands are among the most fertile ecological areas on the planet. They support roughly 5,000 different plant species in the U.S. and a wealth of animal life, including one-third of the nations **threatened and endangered species**. The term wet-land, however, brings with it a vague connotation further obscured by the diversity of wetland forms--**marshes, bogs, wooded swamps,** etc.

Every day determinations are made by agencies as to whether or not a certain area of land is a wetland. These determinations are currently based upon three factors: Vegetation, soils, and **hydrology** (water). For an area to be deemed a wetland 1) it must contain plants adapted to living in wet conditions (eg.: cattails, bulrushes, and lily pads), 2) soils made-up of decomposing organic (living) material formed under wet conditions (a mucky, dark soil consisting mainly of dead plant material with shell fragments from dead crustaceans mixed in, and 3) water at or near the surface for a certain amount of time (highly variable through range of wetland types). This evaluation process, which has been adapted and refined through time is the doorway to either protection or development. It is, as such, one of the most important tools we possess in the area of wetland protection.

PROCEDURE

1. Write the word WETLAND on the top or in the middle of the paper. Have students brainstorm things that are associated with a wetland (i.e. types of trees, birds, animals, insects, wetlands, uses, etc.) List all of the ideas until they have been exhausted.

2. As a class try to group them into similar categories - We suggest using the headings: living things (plants and animals), non-living things (soil and water), and other (recreation, etc.).

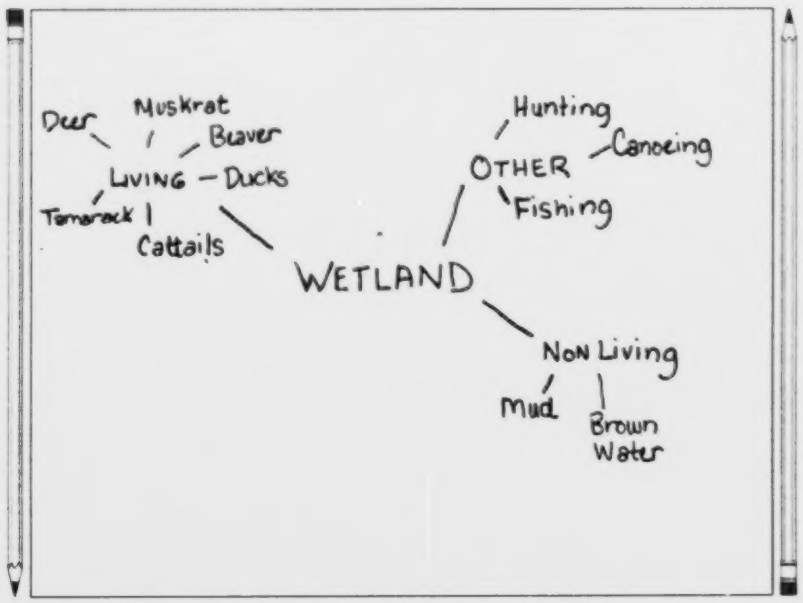
3. In order to help the students understand what makes an area a wetland, it is important to isolate three key elements. Using three colors of markers, circle items on the concept map which relate to plants, soil, or water.

4. Discuss with your students that only plants well adapted to living in wet conditions will be found in wetlands. Plants such as the grass on their lawns would drown, unable to get enough

oxygen to live. Plants like cattail, bulrush, pond lily, and arrowhead have many air spaces in their roots, which allows them to live in water. Everything that dies in a wetland (plants, birds, insects, crustaceans, mammals, etc.) is naturally recycled into marsh soil through the process of decomposition. This process is aided by "decomposers" such as crayfish, fungus, and bacteria which all contribute to the thick mucky soil layer. The amount of water and water movement in a wetland is dependent upon the type of wetland. Some wetland types, like marshes, usually have water above the surface of the ground all year. Other wetland types, like prairie potholes and vernal (summer) ponds, often dry-up in late summer. The water level may be 18 inches below the surface of the ground. The amount of water present at any given time varies greatly through the wide variety of wetland types and seasons. This is one of the greatest difficulties in the definition of "wetland".

5. Save this concept map. At the end of the unit, repeat this activity. This is an excellent way to evaluate student learning

Example of Wetland Concept Map



WETLANDS ARE DIFFERENT-- LIKE YOU AND ME

BACKGROUND

Wetlands come in all shapes and sizes. No two are exactly alike, but they can be put into major categories. For our purposes, the discussion will center around three main types: marshes, wooded swamps, and bogs. These are the most common wetland types found in Wisconsin. Many other wetland types are found throughout the world--vernal (summer) ponds, **prairie potholes**, **fens**, and wet meadows. The differences between these types are great, but all of the wetland types have particular vegetation, soils, and hydrology (water). The differences in form are reflections of the local water movement, availability, composition, and structure of the area on which they are found.

Marshes are characterized by relatively shallow water and a large surface area. Marshes are commonly found in association with lakes, rivers, or streams in areas of low topography. Their position in relation to a river or stream may either be alongside the main channel, or in the middle, with the channel entering and exiting them. Their location affects the shape and make-up of the marsh. Marshes commonly support a wealth of life including: Cattails, bulrushes, sandhill cranes, a variety of waterfowl, red-winged blackbirds, dragonflies, crayfish, painted turtles, and northern pike.

Wooded swamps may be located on the edges of marshes or off by themselves. They are characterized by the presence of woody vegetation in the form of shrubs such as red-osier dogwood, willow or alder, or trees like tamarack and ash. They provide necessary habitat requirements for organisms such as wood ducks, whitetail deer, skunk cabbage, and mosquitos.

Bogs are usually formed in glacial areas and represent the latter stages of old kettle lakes. Kettles are deep cone-shaped depressions in the ground formed by large pieces of ice deposited by glaciers. This depression fills with glacial meltwater and, in time plant communities establish themselves around it. One of the plants that is found in abundance in these areas is sphagnum moss, which moves in as soon a thin soil layer is formed. Sphagnum moss and sedges form a mat and slowly grow over the open water, closing in toward the middle. The water is very cold due to the depth and sunlight-blocking sphagnum mat. The sphagnum moss prefers water with a low ph, so it secretes acidic chemicals. Decomposition of dead plant and animal materials is low due to low temperature and pH. Plants and animals found in bogs need to be very specialized and well-adapted to the unique demands of bog life. Carnivorous plants such as the pitcher plant and the sundew have found a way to get nutrients and water, in these areas where they are hard to get. Other plants such as leather leaf and heath have developed waxy leaves or the ability to turn their leaves

PURPOSE

The purpose of this activity is to compare 3 common wetland types found in Wisconsin.

METHOD

Using information sheets provided, students will conduct research on common wetland types and develop a mural depicting each.

CONCEPTS

*Wetlands are not all the same.

*Wisconsin has three main types.

OBJECTIVES

The student will be able to: 1) identify 3 common wetland types and 2) compare similarities and differences of these types.

SUBJECTS

Science, Art.

SKILLS

Analysis, Classification, Comparison, Description, Research.

MATERIALS

*Student copies of Wetland Types Information Sheets.

*Butcher paper, or wide roll paper.

*Materials for making a mural (colored paper, scissors, glue or tape, markers or crayons, etc.).

GLOSSARY WORDS

Prairie Potholes, Fens.

TIME CONSIDERATIONS

Two 50 Minute Periods.

vertically to avoid water loss during the day. The stickle-back minnow is the only fish that can take the low pH. All forms of life must have big tricks up their sleeves to live in bogs.

PROCEDURE

1. Tell your students, "Now that we know what makes a wet-land a wetland, it is important to realize that there are different kinds." Discuss the fact that these differences are related to the wetlands' location and the physical make-up of the surrounding land. A wetland found isolated in the middle of a forest is going to be different than a wetland found in the middle of a river channel.

2. Divide your class into three groups. Tell them that each group will be learning about different wetland types. After researching different wetland types, they will be asked to create a mural or diorama which shows the wetland in cross section. Murals should depict the organisms found there.

3. Assign one group the marsh wetland type, one wooded swamps, and one bogs. Hand out copies of the Wetland Types Information Sheets to the proper groups. Ask the students to read over the information, then go to your school or public library and have the students search for related information.

4. After collecting further information, have each group plan their mural. Suggest that they draw a sketch of their mural on a small piece of paper before starting the mural.

5. Have the groups complete their murals, referring to the information sheets and research collected as needed. When they are complete, have the group hold their mural up for the whole class to see. A spokesperson for the group should discuss the mural and the wetland type they drew.

6. Discuss the variation and similarity between the wetland forms. Review the necessary components of wetlands: plants, soils, and water. Discuss how each of the three wetland types viewed in this activity possess these three characteristics.

WETLAND TYPES INFORMATION SHEET

MARSHES

Marshes are wetlands with shallow water. They can spread over large areas of land. Some marshes are found in low areas on the edges of lakes, rivers, or streams. Other marshes are found by themselves as a shallow pond or depression. Marshes commonly support a wealth of life including a variety of plants, fish, mammals, reptiles, waterfowl, and other birds. Below are lists of some of the most common marsh organisms.

PLANTS

cattail
bulrush
duckweed
arrowhead
pond lily
water milfoil
wild rice
red-osier dogwood

ANIMALS

mallard duck
great blue heron
sandhill crane
red-winged blackbird
yellow-headed blackbird
marsh hawk
Canada goose
mink
muskrat
beaver
northern pike
yellow perch
painted turtle
bullfrog
dragon fly
giant water bug
crayfish

WETLAND TYPES INFORMATION SHEET

WOODED SWAMPS

Wooded swamps may be located on the edges of marshes or off by themselves. They usually have soggy ground with little surface water. They can be recognized by the presence of shrubs like red-osier dogwood, willow and alder, or trees like tamarack, cedar, and ash. Unlike other wetland types, these shrubs and trees grow throughout the wetland. They provide necessary habitat requirements for a variety of organisms.

PLANTS	ANIMALS
red-osier dogwood	whitetail deer
poison sumac	raccoon
alder	barred owl
tamarack	snowshoe hare
cedar	ruffed grouse
ash	mosquito
skunk cabbage	wood duck
marsh marigold	common water snake
sphagnum moss	green tree frog
	tiger salamander
	grey fox

WETLAND TYPES INFORMATION SHEET

BOGS

Bogs are usually found in areas where glaciers once moved across the land. They are later stages of old kettle lakes. Kettles are deep cone-shaped depressions in the ground formed by large pieces of ice deposited by glaciers. These depressions fill with glacial meltwater. In time sphagnum moss and sedges form a mat and slowly grow over the open water. Eventually this mat may form across the lake. The water in a bog is very cold due to the depth and sunlight-blocking sphagnum/sedge mat. Carnivorous plants such as the pitcher plant and sundew are found here. Bogs are acidic, sort of like Coca Cola. The stickle-back minnow is the only fish able to withstand the low pH. All forms of life must have big tricks up their sleeves to live in bogs.

PLANTS	ANIMALS
pitcher plant	stickle-back minnow
sundew	ruffed grouse
sphagnum moss	great grey owl
sedge	bog lemming
tamarack	snowshoe hare
cranberry	mink
blueberry	American woodcock
	black bear

WETLAND CARTOGRAPHY

PURPOSE

The purpose of this activity is to learn how to locate wetlands from a map.

CONCEPT

Topographical maps are useful tools in locating wetlands.

METHOD

Using the topographical map provided, students will locate wetlands and answer questions on an accompanying worksheet.

OBJECTIVE

The student will be able to:
1)locate wetlands on topographical maps and
2)identify landforms typically associated with wetlands.

SUBJECTS

Science, Geography

MATERIALS

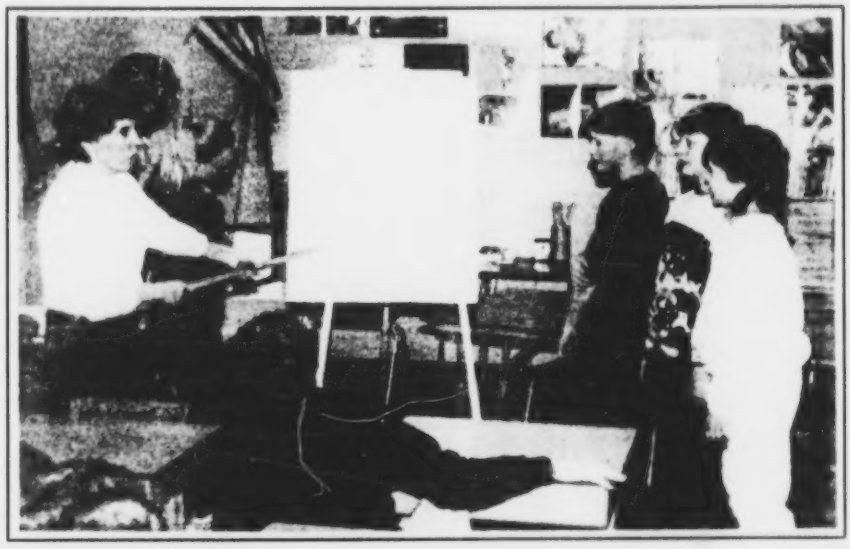
* Copies of Topographical Map Worksheet
* Topographic Transparency Master Sheet.
* Extension A: Copies of Local Topo Map or WWI maps, ordered by teacher.
*Extension B:Playdough

GLOSSARY WORDS

None

TIME CONSIDERATIONS

One 50 minute period



BACKGROUND

Topographical (topo) maps are useful tools in the location of many land-features, including wetlands. Such maps allow the appraisal of the vertical as well as horizontal countryside. If used correctly, they are much more precise than conventional maps. To the casual observer, however, the myriad of symbols and notations may seem overwhelming.

Lines represented on a topographical map are called **contour lines.** Each line connects points of the same elevation above sea level. Contour lines are at spaced intervals of elevation. The difference between these two lines is known as the **Contour Interval (C.I.)**. Contour lines can tell a person much about what the real terrain may look like. Interpretation of a contour map can be easy when considering the following characteristics of a contour line:

1. a contour line, always rejoins itself, even though it may run off a map without doing so;
2. contour lines always bend or "V" upstream where they cross valleys and streams;
3. closely spaced contours indicate a steep slope;
4. widely spaced contours indicate a gentle slope; and
5. evenly spaced contours indicate a uniform slope.

Trying to think in 3-dimensional terms when looking at a one-dimensional map takes some getting used to. Once these skills are mastered you have an advantage in the true appreciation of the landscape.

Larger wetlands are identified by the symbol, . Information specific to wetland types (marsh, wooded swamp, etc.) is provided by this symbol's color coding.

It is possible to view individual wetlands found on topo maps in an even more precise way. Wisconsin Wetland Inventory (WWI) Maps are available. These township aerial photos show wetlands and their associated vegetation types. The scale of these photos allows for a more detailed view than topo maps. Due to scale constraints, many small wetlands under five acres are not included in topo maps. They are, however, found on wetland inventory maps.

EXTENSION

Option A: Have students utilize local topo maps or WWI maps to locate wetlands near your school or community.

Option B: Have the students make three-dimensional relief maps out of clay or playdough of an area on a topo map.

Wetland inventory and topographical maps can be purchased inexpensively from the U.S. Geological & Natural History Survey, 3817 Mineral Point Road, Madison, WI 53705. (608) 263-7389.

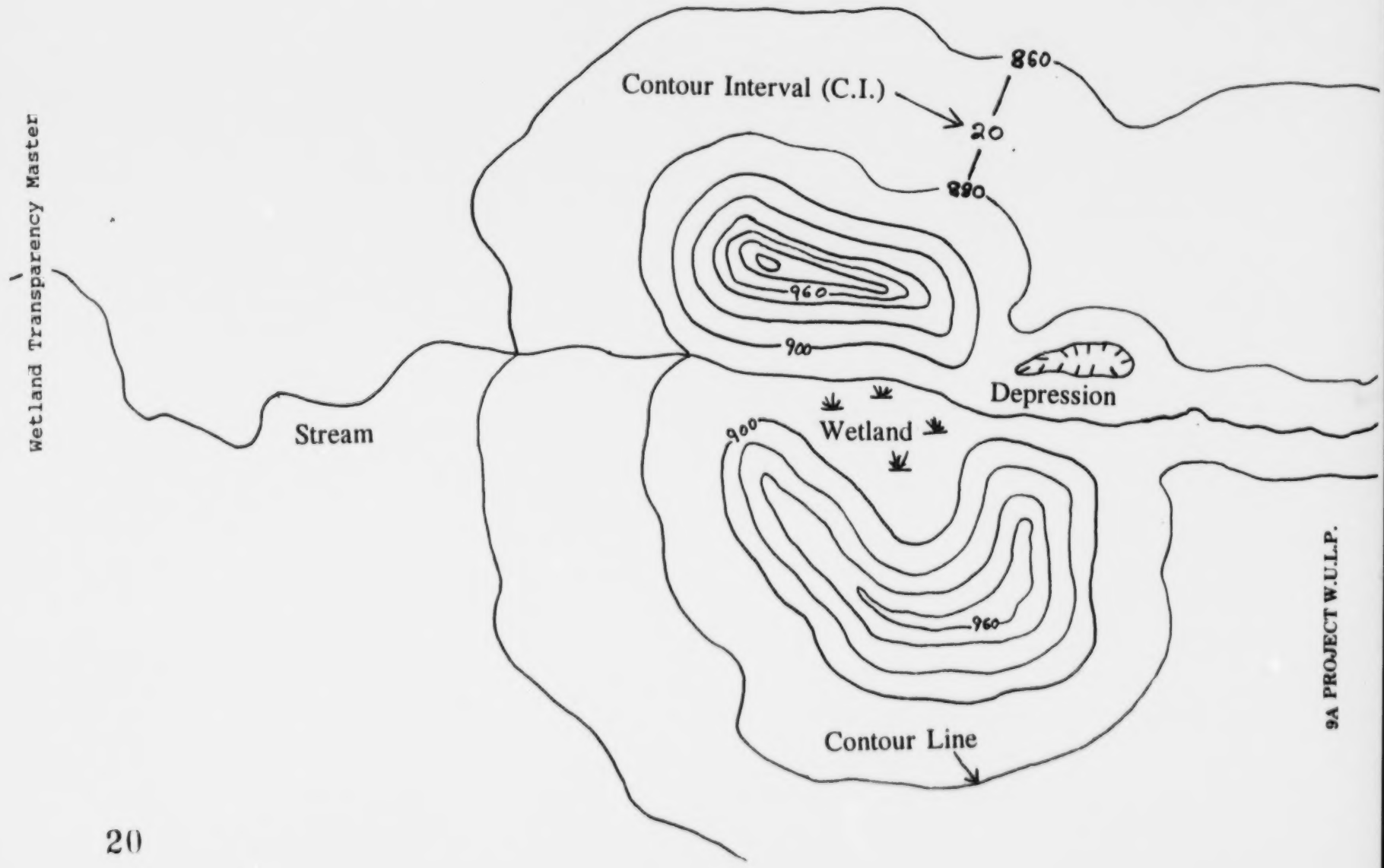
PROCEDURE

1. Make a transparency from the Transparency Master Sheet, and discuss the symbols and map use with the class. Answer any questions and get the students comfortable with the use of topo maps.

2. Divide the class into pairs and give each group a topographical map worksheet. Discuss the information one can see using a topographical map; contour lines - closer the contour lines the steeper the hill - the further the lines the more gentle the slope, height above sea level, depressions, peaks, valleys. Familiarize the students with the symbols on the map: wetlands, roads, buildings, railroads, bridges, lakes, streams.

3. Have each group complete the worksheet related to using the topographical map.

4. Review the completed worksheets together comparing the wetlands located on the map. Discuss what symbol represents a wetland? What features on the map were wetlands mainly associated with? (Typically you would find wetlands in low areas.) Are there any areas close to existing wetlands that have been altered by human activities? (building of bridges, roads, homes, businesses)


Wetland Transparency Master
Contour Interval (C.I.)
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Depression
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Wetland
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9A PROJECT W.U.L.P.

TOPOGRAPHICAL WORKSHEET

To complete this worksheet follow the directions below. Then answer the question related to the map.

Color all wetlands - **green**.

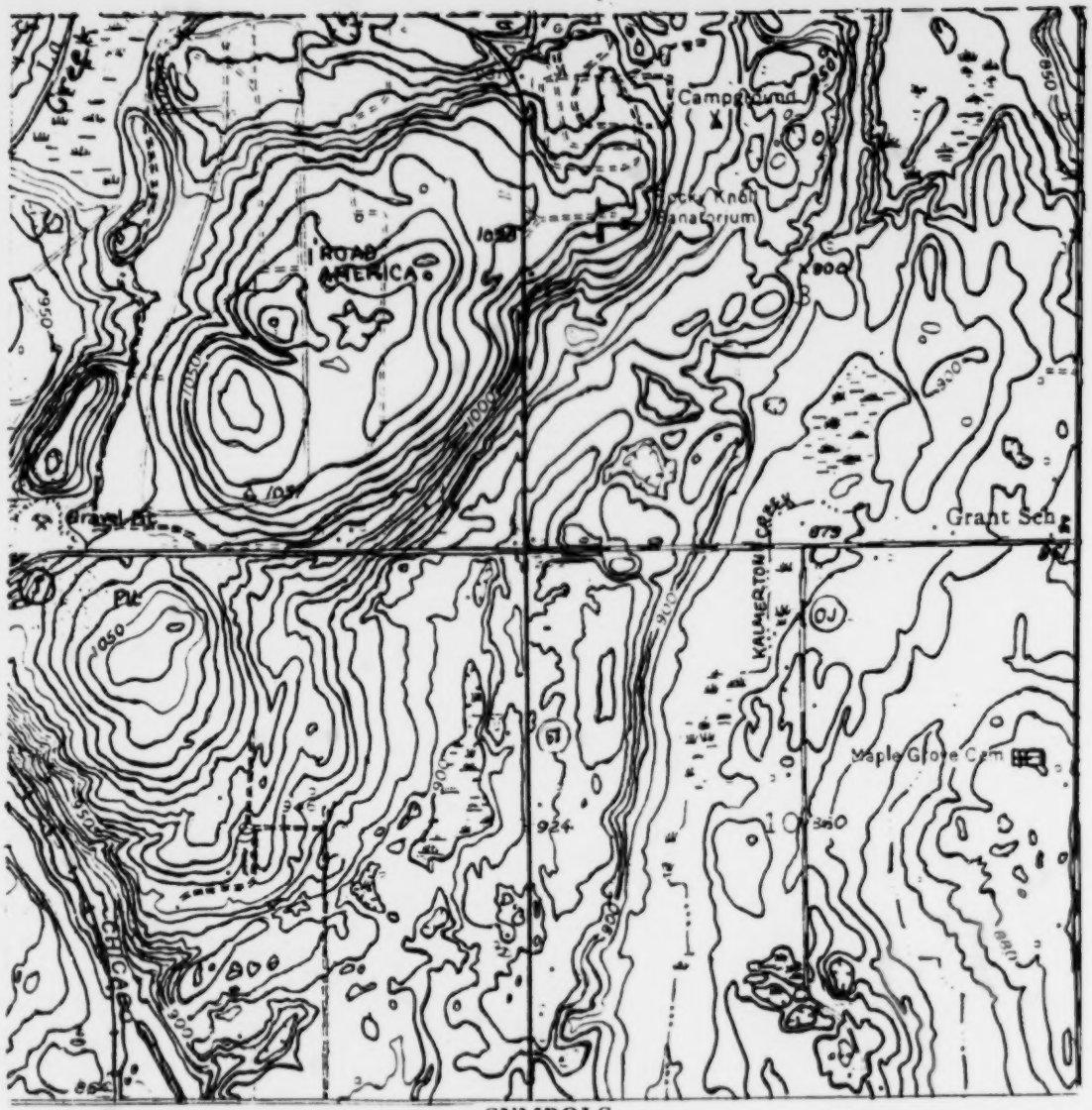
Color all creeks and streams - **blue.**

Color all depressions - **brown.**

Color all hill tops taller than 1050 feet - **orange**.

At what elevation are most wetlands found on this map?

_____



WETLAND IDENTIFICATION 9B

WHO KNEW THEY DID SO MUCH

PURPOSE
The purpose of this activity is explore the important functions wetlands play in our environment.

METHOD
Using everyday household objects, students will compare the functions of objects with the functions of wetlands.

CONCEPT
Wetlands fulfill a variety of important functions in maintaining the environment.

OBJECTIVE
The student will be able to: 1)identify at least five important functions wetlands play in maintaining our environment.

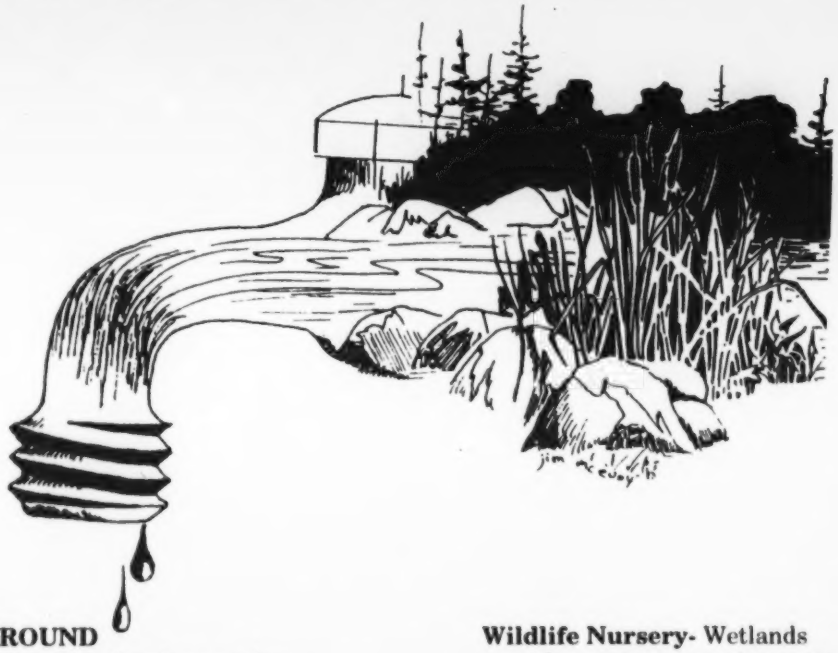
SUBJECTS
Language Arts, Science.

SKILLS
Analysis, Application, Comparison, Interpretation.

MATERIALS
*Wetland Metaphor Box including: Small pillow, sponge, bottle of antacid, baby bottle, bar of soap, vegetable strainer, and a rechargeable battery.

GLOSSARY WORDS
Erosion, Groundwater, Habitat, Nutrient, Aquifers.

TIME CONSIDERATIONS
One 50 Minute Period.



BACKGROUND

The old view of wetlands as useless wasteland couldn't be further from the truth. In actuality, these areas fulfill many vital ecological processes which are invaluable to humans. Flood and **erosion** control, **groundwater** recharge, water purification, and an endless list of benefits occur continuously. These processes, unseen and often unrealized, are similar to the quiet acts of a good Samaritan--seldom noticed or appreciated.

Wetland Functions

Flood and Erosion Control- Water is retained in wetlands and slowly released to rivers and streams. By slowing down this release, flooding and downstream bank erosion are decreased.

Groundwater Recharge- As water is retained in wetlands, it allows water to seep into the ground and re-stock underground **aquifers.**

Water Purification- Wetlands help process chemical, organic wastes and pollutants, and filters out suspended silt and debris from water.

Wildlife Nursery- Wetlands provide necessary requirements for the rearing of a multitude of animal life.

Wildlife Habitat- Wetlands sustain a wealth of animal and plant life and provide a resting place for migrating birds.

Knowledge of the benefits wetlands provide are important to understanding the necessity of preserving those few that remain.

PROCEDURE

1. Prepare a "Mystery Wetland Metaphor Container" (pillowcase, box, or bag). It should be possible for a student to put his/her hand into the container and pull out an object. You may want to collect as many as one metaphoric object per student, but at least have enough for one per group of four students. Put the container aside to use later.

2. Next provide students with background information to serve as an overview of the basic ecological functions that characterize wetlands. For example: sponge effect = absorbs runoff for flood and erosion control;

filter effect = takes out silt, toxins, wastes, etc.; **nutrient** control = absorbs nutrients from fertilizers and other sources that may cause contamination downstream; natural nursery = provides protection and nourishment for newborn wildlife.
Suggest that these activities and many more are taking place in wetlands all the time.

3. Now bring out the "Mystery Metaphor Container". Tell students that everything in the container has something to do with a wetland. Have the students divide into groups of four. Announce that when it is their turn, you want a representative of each group to draw an object from the container. Then as a group, they must figure out what a wetland is or does.

4. Have the designated student reach into the container and withdraw one object. When each group has an object, ask them to work as a team to describe the relationships between their metaphoric object and the wetland. Allow them time to discuss their ideas before doing so in front of the class.

5. Ask each group to report their ideas to the class.

6. Following the discussion and review of the functions represented by each metaphor, ask the students to summarize the major roles that wetlands perform in contributing to habitat for wildlife. List ways in which wetlands are important to humans. Why do humans convert wetlands to other uses? Ask them if their own attitudes about wetlands are different now. If yes, how? If not, why not?

7. For the final part of this activity, ask the students how a wetlands' condition depends on each of us and how our own well-being requires wetland ecosystems. How are humans connected to wetlands? Recreation, aesthetics, utilitarian uses, environmental quality, and nature study are but a few of the connections we each have with wetlands.

OBJECT	METAPHORIC FUNCTION
Sponge	**Absorbs excess water caused by runoff; retains moisture even if standing water dries up (e.g. sponge placed in small puddle of water absorbs water until saturated, then stays wet after standing water has evaporated.**
Pillow	**A resting place for migratory birds.**
Baby Bottle	**Provides a nursery that shelters, protects, and feeds young wildlife.**
Strainer	**Strains silt, debris, etc. from water.**
Soap	**Cleans and purifies the water.**
Rechargeable Battery	**Facilitates recharge of ground water.**
Bottle of Antacid	**Neutralizes toxic substances.**

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MOONLIGHT MADNESS

PURPOSE
The purpose of this activity is to help students understand that wetlands are teaming with life.

METHOD
Students will go on a "simulated field trip" to experience a wetland and graphically represent this image through an art project.

CONCEPT
Wetlands support a tremendous wealth of life.

OBJECTIVE
The student will be able to: visualize the wealth of life that exists in a wetland.

SUBJECTS
Language Arts, Science

SKILLS
Description, Drawing, Listening, Visualization

MATERIALS
* Teacher copy of "Moonlight Madness"
Optional...Frog Songs - "Chorus of Spring Peepers" - audiotape

GLOSSARY WORDS
None

TIME CONSIDERATIONS
One 50 Minute Period.

BACKGROUND
Wetlands hold a large diversity of life. Yet on any given visit to a wetland, the average person has a slim chance of viewing the wealth of plant and animal interactions that exist.

A simulated field trip is a method that allows the participants' imagination to creatively visualize a scene. Using this method, students can be introduced in a few minutes to interactions within a wetland that might otherwise take a lifetime to witness.

PROCEDURE
1. Have the students put their heads on their desks or lay down on the floor. Ask them to close their eyes. Lower the lights in the room.

2. Read the story below to your class. Use expression when reading, and most important don't forget to pause between word phrasings "...." (pause). This will give the students time to visualize the images your are suggesting.

3. Start tape, then begin to read.

4. Discuss what the students heard and saw.

5. Have students draw a picture of a scene within the story.

EXTENSION
If your classroom has an opportunity to visit a wetland later in this unit, you might have your students write their own simulated field trips.

MOONLIGHT MADNESS

Its spring time in the marsh.... Life is returning after the long, harsh winter.... Tender new plants are beginning to emerge from the shallow waters.... As evening approaches, ducks return from neighboring fields.... The honking of a pair of geese can be heard as they head into the safety of the marsh.... A great blue heron takes her last chance at an evening snack.... Like a bolt of lightning, she crashes her head into the water and grabs a young bullhead.... Wandering up to the edge of the water, a raccoon stands quietly, watching the surface..... Suddenly, he pounces into the water after a fish.... Swimming towards shore with a small perch, he gets out and shakes himself vigorously..... The spray from the raccoon scares a leopard frog.... The frog catapults out from a nearby clump of sedges, and startles the raccoon.... Sitting on an old cattail, a red-winged blackbird scolds a trespasser intruding his territory.... it's mating season, he's guarding this area for a special lady... Elsewhere in the marsh, a mink is rambling along the shoreline,... he's a loner and will wander three to five miles tonight.... As the young buck mink slips into a thicket of cattails, we can bet he will have many adventures along the way.... Tracking across the moist ground, a shrew is searching for some dragonflies or other insects that have taken their nightly refuge in the grasses of the marsh.... She's a hungry critter, eating more than her own weight in insects each day.... Overhead, a bat zings bye.... He is feasting on the seasons first newly hatched supply of mosquitoes.... Out of the darkness a barred owl lands in a nearby willow tree.... Perched upon a branch, she turns her head, concentrating on each new sound in the marsh.... Something's in the cattails.... It's a muskrat busily digging up cattail roots.... The muskrat instinctively knows that a cattail root is a good source of food, providing more energy than corn.... Out in deeper water, a crayfish scurries across the bottom attacking a school of minnows.... grasping one and holding it tight, his supper has just begun.... The barred owl bolts from the willow tree and dives to the ground.... clutched amongst his powerful claws, an unlucky meadow vole has seen its last day..... Evening has passed by,... the morning light is starting to show beyond the horizon.... The raccoon scurries one last time to the waters edge,... sniffing at the air, he turns and heads back to his home in a hollow tree.... A mother deer and her two fawns make their way through the tall grass.... They are searching for a safe place to lie down and rest for the day.... Sounds of human activities in the distance are replacing the evening sounds of the marsh.... Geese and ducks are heading back to a nearby field to eat.... As the sun warms the marsh, the sky is starting to fill with the buzz of flying insects.... Another night at the marsh has ended, a new day has just begun....

DETECTIVE W.E.B.--
WETLAND ENERGY BONDS

PURPOSE
The purpose of this activity is to explore relationships within a wetland food web.

METHOD
Students will take part in a structured research project, draw a picture of an organism, and as a class construct a wetland food web.

CONCEPT
Each wetland organism has a preferred habitat type and an important position in the food web.

OBJECTIVES
The student will be able to: 1) describe a wetland organism, 2) identify an organism's environment, and 3) recognize its relationship within the food web.

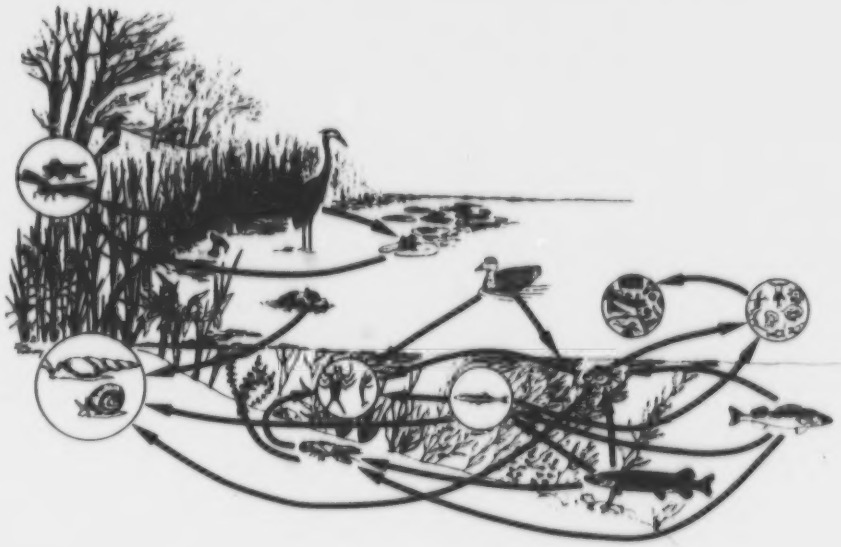
SUBJECTS
Language Arts, Science, Art.

SKILLS
Analysis, Application, Classification, Communication, Inferring, Research, Writing

MATERIALS
*Organism Research Questionnaire
*Tape, Paper, crayons, or markers
*Black board or dry-erase board

GLOSSARY WORDS
Organism, Food Web, Community, Aquatic, Producer, Consumer, Decomposer.

TIME CONSIDERATIONS
Two - Three 50 Minute Periods.



BACKGROUND
Members of a wetland community are in form, function, and behavior, specifically adapted to life's demands. Each organism is an integral part of an inter-dependent system. In these systems, organisms are connected, either directly or indirectly, in a complex matrix of relationships. Negative effects felt by a member of this web, are shared by all. We as humans must realize that our actions often have far-reaching and unforeseeable consequences.

PROCEDURE
1. Attached is a list of organisms for three common wetland types in Wisconsin. Choose one for the following activity. Assign each student an organism that lives in a wetland (see attached sheet with the list of organisms.) The student is then responsible for looking up specific information on that organism.
2. Have each student fill out the "Organism Research Questionnaire", answering specific questions about their organism. Depending on the time available, you may go on to step 3 or have the students write a one page report on their organisms before step 3. Reports should address the information on the questionnaire.

3. Ask the students to create a picture of the organism within its environment. Have the students share their picture and information on the organisms diet, where it lives, what may eat it, and any other unusual or interesting facts about the organism. Designate a wall in your classroom to create a wetland with the pictures the students drew.

4. On a quarter sheet of paper have the students draw just the organism (using crayons or markers will help the organism stand out). Have students write the name of the organism on the drawing so everyone knows what it is.

5. Have students tape the organisms up on the chalk or dry marker board.

6. Once all organisms are up, ask the students what organism eats what (see attached relationships sheet for help). Draw a line connecting the two organisms. (Its best to stay with one organism until all connections have been exhausted, then go to another organism). Do this until all organisms have at least one connection. Discuss

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with the students that what they see as a mess of overlapping lines represents a food web.

7. Ask the students what would happen to the web if one or more of the organisms died. To represent deaths take down the pictures of several wetland organisms. This will leave blank spots. Discuss with the students that any organisms which are connected to this spot would be affected. This would, in turn, affect the organisms which depend upon them, and so forth throughout the food web, (i.e. if seed shrimp die, this affects damselfly nymphs, which affects bluegills, which affects northern pike, and may affect us). Much like the child who only eats peanut butter and jelly sandwiches, some organisms will only eat certain kinds of foods, We call these organisms specialists, because of their narrow diet choices. Generalists are organisms which feed on a wide range of foods. Because of the specialists' inability to adapt to changes in the food web, they are impacted more severely by changes in the food web than the generalists. Discuss these concepts with your students. Ask students which organisms appear to be specialists? Generalists?

Tell the students that if you untangled this web, you would find that all organisms are directly or indirectly connected to each other. One break in the chain can have devastating affects on all organisms within the marsh.

LIST OF ORGANISMS FOR RESEARCH PAPER

1. MARSH

PLANTS

____PHYTOPLANKTON
____WILD RICE
____CATTAIL
____FILAMENTOUS ALGAE

AQUATIC INVERTEBRATES

____MOSQUITO
____COPEPOD
____DRAGONFLY
____ZOOPLANKTON
____LEECH
____GIANT WATER BUG
____CRAYFISH
____DAMSELFY NYMPH
____DAPHNIA

VERTEBRATE ANIMALS

____MUSKRAT
____BLUEGILL
____BULLHEAD
____SPOTTED SALAMANDER
____LEOPARD FROG
____CANADA GOOSE
____GREAT BLUE HERON
____MUD MINNOW
____MALLARD DUCK
____PAINTED TURTLE
____NORTHERN PIKE
____RACCOON
____YELLOW-HEADED BLACKBIRD
____SHORT-TAILED SHREW
____GREAT-HORNED OWL
____MARSH HAWK
____MINK

LIST OF ORGANISMS FOR RESEARCH PAPER

2. BOG

PLANTS

____CRANBERRY
____BLUEBERRY
____WILLOW
____PITCHER PLANT
____SEDGE

INVERTEBRATES

____BOG MOSQUITO
____TREE HOPPER
____DEER FLY
____MOURNING-CLOAK BUTTERFLY
____CICADA
____ORB-WEAVING SPIDER
____PAPER WASP

VERTEBRATE ANIMALS

____SOUTHERN BOG LEMMING
____AMERICAN WOODCOCK
____SCREECH OWL
____LITTLE BROWN BAT
____NORTHERN GOSHAWK
____RUFFED GROUSE
____WOOD DUCK
____FOUR-TOED SALAMANDER
____WHITETAIL DEER
____SPRING PEEPER
____STICKLEBACK
____RACCOON
____SNOWSHOE HARE
____COMMON WATER SNAKE
____MINK
____BLACK BEAR
____ARTIC SHREW
____RAVEN

3. WOODED SWAMP

PLANTS

____WHITE CEDAR
____ASPEN
____RED-OSIER DOGWOOD
____BLACKBERRY
____TAMARACK
____SPHAGNUM MOSS
____SEDGE

INVERTEBRATES

____MOSQUITO
____GYPSY MOTH
____BLUE BOTTLE FLY
____CICADA
____DEER TICK
____PAPER WASP
____BARK-BORER BEETLE
____EARTHWORM

VERTEBRATE ANIMALS

____BARRED OWL
____WHITETAIL DEER
____AMERICAN CROW
____WHIP-POOR-WILL
____SNOWSHOE HARE
____GARTER SNAKE
____STAR-NOSED MOLE
____BLACK BEAR
____RUFFED GROUSE
____COOPER'S HAWK
____RED SQUIRREL
____SWAMP CHORUS FROG
____AMERICAN WOODCOCK
____YELLOW WARBLER
____BLUE JAY

ORGANISM QUESTIONNAIRE

Every organism in a wetland is important. The organism I'm going to find out more information on is:

_____

If your organism is a plant, answer the following questions.

What does your plant look like?

What color is it? Does it have leaves?

Does it flower? Does it have a smell?

Where does your plant live within a wetland? (water, shoreline, marsh meadow, wooded swamp, etc.)

What does your plant need to stay alive?

How long does your plant live? (days, months, years)

Where is the plant located within the food chain? (producer, consumer, decomposer)

Do people use your plant for anything? (medicine, food, shelter, etc.)

What happens to the plant during the winter?

If your organism is an animal, answer the following questions.

What does you animal look like?

How many eyes? How many legs?

Does it have wings? Does it have fur?

What color is it?

Where would you find your animal in a wetland? (water, soil, marsh grasses, wooded swamp, etc.)

What things might your animal eat to stay alive?

How long does your animal live? (days, months, years)

Where is your animal located within the food chain? (producer, consumer, decomposer)

What things might eat your animal?

Do people hunt your animal? If so, for what reasons. (fur, food, medicine, clothing, sport)

What happens to the animal during the winter? (hibernate, migrate, change in habits or diet)

LIST OF MARSH ORGANISM CONNECTIONS

PLANTS	
1. PHYTOPLANKTON	5,7,9,12,13
2. CATTAIL	14
3. WILD RICE	14,22,27,29
4. FILAMENTOUS ALGAE	5,7,9,12,13,17,22,27
AQUATIC INVERTEBRATES	
5. MOSQUITO	1,4,6,7,10,11,12,13,14,15,17,18,19,20,21,26,27,29,30
6. GIANT WATER BUG	5,7,8,10,11,13
7. COPEPOD	1,4,5,12,26
8. LEECH	15,17,28
9. CRAYFISH	1,4,7,8,15,16,17,18,20,26,28,30
10. DRAGONFLY	5,7,11,12,13,15,17,21,26,29
11. DAMSELFLY NYMPH	5,6,7,10,12,13,15,17,26
12. ZOOPLANKTON	5,6,7,10,11,13,26
13. DAPHNIA	5,6,10,11,12,15,26
VERTEBRATE ANIMALS	
14. MUSKRAT	5,2,3,17,30
15. BLUEGILL	5,7,8,9,10,11,12,13,16,17,18,24,26,28,30
16. NORTHERN PIKE	8,9,15,17,18,19,20,21,24,26,27
17. BULLHEAD	1,4,5,7,8,9,10,11,12,13,14,15,16,18,24,26,28,30
18. RACCOON	5,8,9,15,17,19,20,26,28
19. SPOTTED SALAMANDER	5,8,10,11,15,16,18,21,24,28,30
20. LEOPARD FROG	5,8,9,10,11,15,16,17,18,21,24,28,30
21. SHORT-TAILED SHREW	5,10,16,23,25,30
22. CANADA GOOSE	1,3,4,
23. GREAT HORNED OWL	14,18,21,25,27,30
24. GREAT BLUE HERON	8,9,15,16,17,19,20,26
25. MARSH HAWK	14,20,21,30
26. MUD MINNOW	1,4,5,6,7,9,11,12,13,15,16,17,18,24,28,30
27. MALLARD DUCK	1,3,4,5,16,23,25,
28. PAINTED TURTLE	8,9,15,17,18,19,20,26,30
29. YELLOW-HEAD BLACKBIRD	3,5,10
30. MINK	5,8,9,14,15,16,17,19,20,21,22,23,25,26,27,28,29

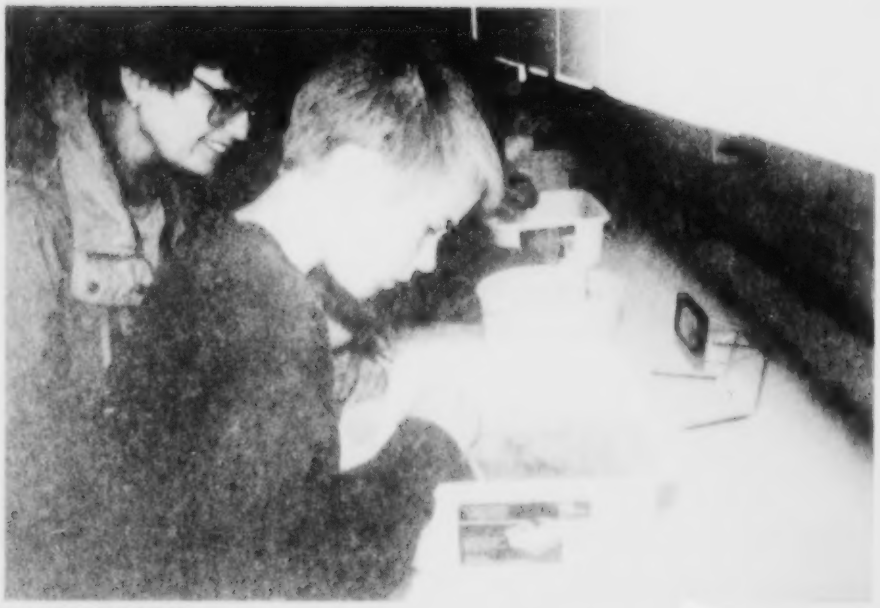
LIST OF BOG ORGANISM CONNECTIONS

PLANTS	
1. CRANBERRY	8,11,13,18,23,25,26
2. PITCHER PLANT	6,8,9,10,11
3. BLUEBERRY	8,11,13,18,23,25,26
4. SEDGE	8,13,20,26,29
5. WILLOW	7,8,12,20,29
INVERTEBRATES	
6. BOG MOSQUITO	2,9,14,15,16,19,23,27,28
7. CICADA	5,17,19,28
8. TREE HOPPER	1,2,3,4,5,9,14,15,17,19,23,27,28
9. ORB-WEAVER SPIDER	2,6,8,10,11,12,14,15,27,28
10. DEER FLY	2,9,13,14,15,16,18,19,20,23,24,26,27,28,29
11. PAPER WASP	1,2,3,9,14
12. GYPSY MOTH	5,17,19,23,27,28
VERTEBRATE ANIMALS	
13. SOUTHERN BOG LEMMING	1,3,4,17,21,22,24,30
14. SPRING PEEPER	6,8,9,10,11,17,18,22,24,27,28,30
15. AMERICAN WOODCOCK	6,8,9,10,17,21,24
16. STICKLEBACK	6,10,18,22,24,27,28,30
17. SCREECH OWL	7,8,12,13,14,15,19,21,22,23,24,27,28
18. RACCOON	1,3,10,14,16,27
19. LITTLE BROWN BAT	6,7,8,10,12,17
20. SNOWSHOE HARE	1,3,4,5,21,30
21. NORTHERN GOSHAWK	13,15,17,18,20,22,23,24,25,28
22. COMMON WATER SNAKE	13,14,16,27,28
23. RUFFED GROUSE	1,3,6,8,9,10,12,17,21,24
24. MINK	13,14,15,16,17,22,23,27,28
25. WOOD DUCK	1,3,4,21,24
26. BLACK BEAR	1,3,4
27. FOUR-TOED SALAMANDER	6,8,9,10,12,14,16,17,18,22,24,28,30
28. ARTIC SHREW	6,7,8,9,10,12,14,16,17,21,22,24,27,30
29. WHITETAIL DEER	4,5,30
30. RAVEN	13,14,16,20,22,27,28,29

LIST OF WOODED SWAMP ORGANISM CONNECTIONS

PLANTS	
1. WHITE CEDAR	12,17,18,21,24
2. TAMARACK	12,21
3. ASPEN	9,12,13,17,18,24
4. RED-OSIER DOGWOOD	9,12,13,18,24
5. SEDGE	18,24,30
6. BLACKBERRY	10,17,18,24,29,30
INVERTEBRATES	
7. MOSQUITO	17,18,21,22,24,27,28,30
8. DEER TICK	17,18,21,23,24,28,29,30
9. GYPSY MOTH	3,4,6,22,23,27
10. PAPER WASP	6,23,27,29
11. BLUE BOTTLE FLY	17,18,22,23,27,29
12. BARK-BORER BEETLE	1,2,3,4
13. CICADA	3,4,6,22,27
14. EARTHWORM	23,25,26,28,29
VERTEBRATE ANIMALS	
15. MINK	14,16,17,19,20,21,22,23,25,26,28
16. BARRED OWL	15,17,19,20,21,22,23,24,25,26,28,29
17. RUFFED GROUSE	1,3,6,7,8,9,11,15,16,19,20
18. WHITETAIL DEER	1,3,4,5,6,7,8,11,20
19. COOPER'S HAWK	15,16,17,20,21,22,23,24,25,26,27,28,29
20. AMERICAN CROW	6,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30
21. RED SQUIRREL	1,2,7,8,15,16,19,20
22. WHIP-POOR-WILL	7,9,11,13,15,16,19
23. SWAMP CHORUS FROG	7,8,9,10,11,14,15,16,19,20,26,29
24. SNOWSHOE HARE	1,3,4,5,6,7,8,11,15,16,19,20
25. AMERICAN WOODCOCK	7,8,11,14,15,16,19,20
26. GARTER SNAKE	14,15,16,19,20,23,29
27. YELLOW WARBLER	7,9,10,11,13,19,20
28. STAR-NOSED MOLE	14,15,16,19,20
29. BLUE JAY	6,7,8,9,10,11,12,13,14,16,19,20,23,26
30. BLACK BEAR	5,6,7,8,11

JOURNEY TO THE BOTTOM OF THE PAIL



PURPOSE
The purpose of this activity is to explore the wealth of micro-life existing at theobottomland food chain.

METHOD
Examining samples taken from a wetland, students will separate organisms into like-categories and identify individual organisms using an aquatic key.

CONCEPT
Wetlands provide habitat for a variety of aquatic micro-organisms.

OBJECTIVES
The student will be able to: 1) recognize the biodiversity that exists in a wetland ecosystem, 2) sort wetland organisms into categories by similarities, and 3) identify individual wetland organisms.

SUBJECTS
Science.

SKILLS
Classification, Comparison, Description, Identifying, Matching, Observing, Recognizing

MATERIALS
*Key, collection equipment-nets, kitchen sieves, dish pans, ice cream pails, ice cube trays, eye droppers, tweezers.

GLOSSARY WORDS
Biodiversity, Ecosystems, Entomology, Invertebrate

TIME CONSIDERATIONS
One 50 Minute Period.

BACKGROUND
An old proverb says, "Tell me and I'll forget, show me and I'll remember, involve me and I'll understand." This is the basis for experiential education. This "hands-on" approach is an opportunity to address a different style of learning.

The best way to explore the diversity of life in wetland **ecosystems** is to get "down and dirty". Roll up those sleeves and search different wetland areas. Each species of organism has it's own preferred location, so search the surface, in the vegetation, or on the bottom. You don't need to have a degree in **entomology** to facilitate learning. Nobody expects you to. Using simple aquatic keys and field guides, teacher and students can learn together. More importantly, don't concentrate on identifying. Look at the organisms body form and adaptations to wetland life. Group organisms into categories by similarities. Concentrate on the investigation and personal exploration. Answer questions that come up naturally, like "why do these all come from way down deep?" or "what's all this green slime?". Learning is relevant when it answers one's questions.

SPECIAL NOTE
There are two ways to approach the biodiversity section of the unit. Depending upon your preference or logistical constraints, you may either opt for a classroom study or field component. A one day field experience is outlined in the appendix section.

PROCEDURE
1. Collect water from a wetland either as a class or ahead of time. Bring water samples to the classroom in buckets. Its good to have at least several buckets of water per class. When collecting samples try to collect the organisms that live on and near the bottom, in and near vegetation, in open water, and on the surface of the water. Don't collect a lot of silty mud. It will be difficult to see any organisms if the water is not clear.

2. Have students work in pairs. Each pair should have at least a quart of the sample. Ask students to sort out like organisms found within their sample. Ice cube trays filled with water work well to sort the aquatic organisms. Remind the students many of the

organisms within their sample are microscopic in size and maybe unable to detect. Have microscopes available for students to use.

3.After sorting, have the students observe and answer the following questions about each organism.

What color is the organism?
How big is it? What is its shape?
How does it move?
How does it breathe?
Does it have legs? wings? eyes? mouth?

4. Have students identify the organisms using an aquatic **invertebrate** key (see attached key).

5. Discuss with the students the variety of organisms they saw within their sample. Each organism has a specific role that it plays within the marsh. Discuss with the students that these organisms are a base or foundation for the food web that supports all the other organisms that live within the marsh.

SUGGESTED REFERENCE BOOKS

*Golden Guide-Pond Life. Golden Press, New York.

*Eyewitness Books. Pond and River. Knopf, New York.

INSECTS

Lives in water during early stages of life

Larvae

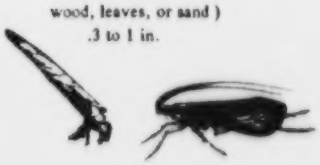
Mosquito
(larvae appears hairy)
.2 to .4 in.

Midgefly
(larvae wormlike, sometimes red in color)
.2 to .4 in.

Cranefly
(larvae has breathing disk at end of tail)
.5 in.

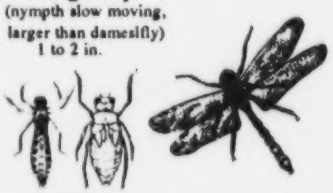
Dobsonfly
(larvae very large, strong jaws, 7-8gills along abdomen)
1 in. and up

Caddisfly
(larvae live in cases of wood, leaves, or sand)
.3 to 1 in.



Nymphs

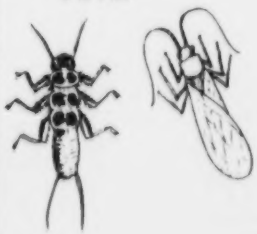
Dragonfly
(nympth slow moving, larger than damesifly)
1 to 2 in.



Damesefly
(nymphs thin, three leaf-shaped gillson tips of abdomen)
.5 to 1 in.

Mayfly
(nymphs short legs, featherlike tails, gills along abdomens)
.5 to 1 in.

Stonefly
.5 to 1 in.



Lives in water during most of its life

Beetles
(wings under shell, chewing mouth parts)

Diving Beetle
(dives and swims)
.25 to 1 in.

Whirligig Beetle
(lives on surface)
.25 to .5 in.

Scavenger Beetle
(swims using hind legs)
.25 to 1 in.

Water Bugs
(wings overlap, sucking mouth parts)

Giant Water Bug
up to 3 in.

Backswimmer
(swims on back)
.25 to .5 in.

Water Boatman
(swims on stomach)
.25 to .5 in.

Water Scorpion
(tail forms breathing tube)
1 to 3 in

Water Striders
(skims across surface using legs)
.25 to 1 in.

Springtails
(spring-like tail under stomach)
.1 in.

CRUSTACEANS

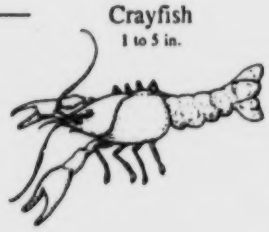
Seed Shrimp
(bi-valved, move by kicking legs and antennae)
microscopic

Scud
(swims on side)
.1 to .3 in.

Water Flea
microscopic

Copepod
(egg sacs sometimes attached to tail)
microscopic

Crayfish
1 to 5 in.



SPIDERS (ARACHNIDS)

Water Mite
(brightly colored, very small)
microscopic

Water Spider
(carries air supply on abdomen to help breath under water)

WORMS

Leech
(suckers on mouth and tail)
up to 3 in.

Planaria
(unsegmented, appears cross-eyed)
.1 to 1 in.

Tubifex Worm
(reddish worm, segmented)
.5 to 1 in.

IT'S A QUESTION OF VALUES

PURPOSE
The purpose of this activity is to examine values associated with wetlands.

METHOD
After a discussion on environmental values students will evaluate and differentiate examples into appropriate value categories.

CONCEPT
Wetlands are important to different people for different reasons.

OBJECTIVES
The student will be able to: 1) describe six value categories, and 2) recognize examples of each.

SUBJECTS
Language Arts, Social Studies

SKILLS
Analysis, Classification, Comparison, Identifying, Matching, Recognizing

MATERIALS
***Values category worksheet**
***Value Cards**

GLOSSARY WORDS
None

TIME CONSIDERATIONS
One to Two 50 Minute Periods.

BACKGROUND

What is a wetland worth? Each of us value an environmental area for different reasons. It's a matter of perspective. Some recognize the money to be made, while others enjoy it's beauty. Individuals may value an area from a recreation, education, egocentric, ecologic, economic, and/or aesthetic point of view. While many of these are linked, others are diametrically opposed and are therefore the source of conflict.

Value Categories

Economic- Worth in terms of dollars and cents. Example: This wetland is valued at one-million dollars for development purposes or tourism potential.

Aesthetic- Worth in terms of appreciation of the beauty of the natural surroundings. Example: This wetland is a sea of color and sound.

Recreation- Worth in terms of leisure time uses. Example: This wetland is the best place to hunt ducks in the county.

Education- Worth in terms of learning/instructional benefit. Example: This wetland is a place where my fourth grade class goes to learn about adaptations.

Egocentric- Worth in terms of what it offers an individual. Example: This wetland is my favorite place to sit and read.

Ecologic- Worth in terms of maintaining the integrity of natural systems. Example: This wetland is a place where 300 Canada geese nest every spring, and 20,000 stop at on their migration South for winter.

PROCEDURE

1. Introduce the definition of values. A value is the relative worth placed on an object or area. Discuss with the students, the six different value categories, giving the students an example of each.

2. Hand out the one Values Category Worksheet to each student and one sheet of value cards.

3. Have students cut out each value card (cut along lines). Each student should have 18 value cards.

4. Students should begin by placing the value cards on the chart without gluing This will allow them to move the cards if necessary. Each value category will have three values. It is important for students to understand that some belong under more than one value category. Once the cards are in place, have them glue them down.

5. After students have completed glueingluingards, discuss where they placed each value, and why. Discuss that some of these values could be in more than one category.

WETLAND VALUE CARDS

this marsh is my secret hunting spot	fishing	duck hunting	spawning grounds for northern	bird watching	millions of dollars saved in flood control
draining and filling wetlands for farmlands and/or development	cleanses water	classroom visit to a wetland	I own this wetland I can do what I want	trapping and selling furs	listening to frogs
smell of the cool damp air on a hot summers evening	discovering microscopic plants and animals	this is my favorite place, I grew up playing here	canoeing	collecting insects	nursery for migratory birds

41

42

WETLAND CATEGORY WORKSHEET

ECONOMIC	AESTHETIC	RECREATION	EDUCATION	EGOCENTRIC	ECOLOGIC

CAN'T TELL THE PLAYERS WITHOUT A PROGRAM

PURPOSE
The purpose of this activity is to learn to dissect an environmental issue into its opposing parts.

METHOD
Analyzing a news article, students will isolate the players and their associated beliefs and values.

CONCEPT
Environmental issues are better understood when broken down into their summative parts.

OBJECTIVES
The student will be able to: 1) define the terms belief, value, problem, and issue, and 2) analyze an environmental issue recognizing the "players" and their associated beliefs and values.

SUBJECTS
Language Arts, Social Studies.

SKILLS
Analysis, Classification, Comparison, Identifying, Matching, Recognizing.

MATERIALS
*Copies of Boggsville-A Town Divided
*Copies of Issues Analysis Worksheet
*A blackboard, flip-chart, or dry-erase board

GLOSSARY WORDS
None.

TIME CONSIDERATIONS
One 50 Minute Period.

EXTENSION
Have the students find newspaper or magazine articles on local or regional issues and use the above method to investigate the issue.

BACKGROUND
Much of the difficulty in understanding and dealing with an environmental issue often lies with identifying conflicting components. To understand the whole as the sum of its parts, it is necessary to isolate and identify each part. By doing this we can gain a clearer picture of the problem and possible solutions.

Definition of terms

Problem- A condition in which the status of someone or something is at risk.

Belief- Those ideas held by an individual as the truth regardless of whether they are true or false.

Value- Relative worth, merit or usefulness

Issue- A point in question or a matter in dispute due to differing beliefs and values. A controversy over whether a problem exists or what the problem is

Players- Those individuals having a role in an issue.

PROCEDURE
1. Discuss with your students the definitions of a belief, value, and problem. Ask them to give examples of an environmental problem. Ask your students what an issue is? How does it differ from a problem? (A problem doesn't become an issue unless it is controversial--people having different beliefs and values.) Discuss that the players in an issue are the people involved.

2. Divide the class into groups of 4. Distribute copies of "Boggsville--A Town Divided" to each class member and the "Issues Analysis Worksheet" to each group. Tell the students they will be analyzing an environmental issue. Ask them to read the story individually and underline the players. After reading the story, have each small group fill out the "Issues Analysis Worksheet". Their job is to identify the issue, name the key players, summarize the players beliefs, and identify the values driving those beliefs. See attached answer sheet.

3. Discuss in large group, the findings of each of the small groups. Discuss what was the issue, who were the players, and what were their respective beliefs and values. Ask the students why they think these individuals had these beliefs and values. Discuss why educating people about the functions and values of wetlands is very important to their preservation.

REFERENCES
Activity adapted with permission from Hungeford, Ramsey, and Volk. A Technique for Analyzing Environmental Issues. 1989.

"Boggsville-- A Town Divided"

Dawn on the Boggsville Marsh brings with it a flurry of activity.With the growing light, ducks leave this wetland in great waves heading for fields to fill their stomachs with corn. Muskrats munch contentedly on young cattail tubers. Turtles come out to sun themselves on floating logs. In the nearby hamlet of Boggsville there is also a flurry of activity. Conversation centers around one thing, the City Zoning Meeting.

It seems that quiet little Boggsville, where life usually moves at a slower pace, is entangled in a massive battle over development plans. The project proposes locating a Maxi Mart department store and gas station on a 60 acre parcel of private land now known as Boggsville Marsh. At the fore-front of the controversy is Mr. David Dresser, president of Maxi-Mart Corporation. When asked for his view, Dresser said, "This is the best location for this business. It's near the high traffic part of town unlike other properties in the area." Marty Higgins, the construction project director, said, "It's not a problem. Once this property is re-zoned, we've got plenty of fill to do the job."

Leesa Olsen, a member of the Boggsville Zoning Board and a local realtor, was quoted as saying, "I have no business ties to this venture, but feel that it will bring economic growth to Boggsville. I will vote in favor of the project." On the opposite end of the spectrum we find local resident Elmer Willas, also a zoning board member, and his wife Bertha. "I've hunted that marsh for almost 40 years, and Bertha likes to bird watch occasionally" said Elmer. "Now where's our granddaughter going to hunt when she grows up?"

Steve and Jane Pinick, are the owners of the land in question. When asked how they feel about making a final decision that affects so many people they responded, "Mr. Dresser is a responsible businessman, and we feel that his proposal sounds acceptable. It's nobody's business but ours what we do with that land, no matter what Wahoske and his gang say." This comment regarding Joseph Wahoske, a representative of the Boggsville Rod and Gun Club, stems from both verbal and written reactions by Wahoske to the building proposition. Wahoske is quoted as saying "If people like them have anything to say about it, we'll all be living in a concrete jungle. It's all greed." He also stated that the Ducks Unlimited organization, of which he is an active member, will "fight this tooth and nail".

"Virtually everyone in Boggsville has something to gain or lose in this deal. Believe me they're vocal", exclaims Greg Kramer, local resident of 13 years and Dept. of Natural Resources Biologist. "It's my responsibility to objectively look at the facts and determine how the project will affect the Boggsville Marsh." Another person taking public heat over this issue is Mary Bennett, the president of the Boggsville Chamber of Commerce. She has public and political pressure from both sides to deal with.

It is plain to see that both the controversy and the town are powder kegs waiting for a match. This will not be easy to resolve due to the opposition of equal forces. Hopefully the little town of Boggsville won't remain a town divided.

ISSUES ANALYSIS WORKSHEET

What is the issue? Developing Boggsville Marsh into Maxi-Mart

Player	Belief	Value
David Dresser	The marsh is the best place for Maxi-Mart	Economic
Marty Higgins	Construction of Maxi-Mart shouldn't be a problem	Economic
Leesa Olsen	Buiding Maxi-Mart in Boggsville will help bring economic growth to the community	Economic
Elmer Willas	Maxi-Mart should go elsewhere or my granddaughter and others won't have a place to hunt	Recreational
Bertha Willas	By building Maxi-Mart on the Boggsville marsh will destroy much of habitat for birds and wildlife.	Recreational/Aesthetic
Steve & Jane Pinick	Maxi-Mart corporation is a good business, the deal sounds good, besides its nobody's business but ours	Economic
Joseph Wahoske	The proposed venture is bad. It will ruin the marsh.	Recreational
Greg Kramer	We must do some studies on how building the Maxi-Mart will have any affects on habitats and wildlife.	Ecologic
Mary Bennett	UNCLEAR	UNCLEAR

ISSUES ANALYSIS WORKSHEET

What is the issue?		
Player	**Belief**	**Value**
	48	

OUR WETLAND LEGACY

PURPOSE
The purpose of this activity is to document the impact humans have had on wetlands.

METHOD
Students will read a story and plot events on a time line.

CONCEPT
The history of wetland's destruction has been short, but extensive.

OBJECTIVES
The student will be able to: 1) track the history of wetlands destruction, and 2)list three ways wetlands are destroyed.

SUBJECTS
Language Arts, History, Social Studies.

SKILLS
Analysis, Interpretation, Inference, Predicting, Reading.

MATERIALS
*Copies of Wetland History Time line Worksheet
*Copies of "When Push Comes to Shove"

GLOSSARY WORDS
None

TIME CONSIDERATIONS
One 50 Minute Period.

BACKGROUND
The history of human impact on wetland ecosystems is a story of rapid, drastic change. We are only now beginning to see some of the results of our actions. In less than 200 years, Wisconsin has lost 75% of it's original 10 million acres of wetlands. The trend continues nationally with approx. 500,000 acres destroyed annually. This is similar in scope to the tropical rainforest devastation currently accepted to be an environmental threat of monumental proportion.

With destruction on this scale occurring, why are so many people totally unaware? The changes take place subtly over time, like aging. The "big picture" often has been obscured by short-term benefit. For many people this understanding can only be realized by such events as the great Midwest flood of 1993. Only then can we see the symptoms of an unbalanced system.

In order to comprehend where we're at, we must first look at the sequence of events that got us to this point. Only with this understanding can we be a catalyst for the restoration of the natural wetland balance.

PROCEDURE
1. Discuss use of time lines as tools for organizing historical events chronologically.

2. Hand out copies of Wetland History Time line Worksheet. Tell the students that they will read a story which will give them the information needed to place the correct events in the proper locations on the time line. All of the answers can be found within the story, but some will take a little thought. See attached answer sheet.

3. Have the students read the story "When Push comes to Shove" and underline events or happenings. Tell the students to pause every time they encounter an indication of a specific time, and check the time line to see if it's one of the events. Next, have the students fill out the Time line Worksheet.

4. After students have completed the worksheet, go over the correct answers with the whole class.

5. Share with the students the "big picture" regarding what this time line really means in terms of time and relative change. Ask the students how much time it actually took for the present total of wetland destruction to occur. The amount of growth and wetland destruction demonstrated by this time line is dramatic. At times 500,000 acres were lost per year, and what was once 10 million wetland acres in Wisconsin was cut by 75% in just 150 years. Ask the students "What does the future hold for wetlands? How will this be controlled by what the public thinks and their attitudes about wetlands?"

WHEN PUSH COMES TO SHOVE

I've seen it all. In my travels and in times when I sat still for thousands of years, I've seen this place change. Animals, plants, and people come and go. The whole adventure started when I was living in Canada. It was really cold for a long time. I was sleeping, when suddenly I was awakened by something nudging me from behind. I looked up to see what it was, but all I could see was a wall of ice. I yelled up at it, "Hey buster! What's the big idea!", and he replied "Don't blame me, this is not my idea!" Slowly but surely, two inches a year, he bumped and nudged me along. After talking for awhile, we became friends and I got used to him. Our travels took us hundreds of miles to the southwest, into what's now the United States. Eventually I started to notice a change, the nudges were less frequent. We were moving slower and slower. I asked my friend what was wrong. He replied, "I've been sweating and loosing weight. I think I'm going to have to rest." With a lurch we stopped. We talked awhile, and I noticed that my friend was getting smaller. The air was getting warmer. Slowly my friend moved away from me. We both knew what was happening. The unseen thing that had moved him forward when the air was cold was now fleeing to Canada. I was sad to see him go, for I could not go with him.

I was in a new land with many others like me. This was before you were born, about 10,000 years ago. I looked around and saw that water was gathering in all the low spots. This was what my friend called "sweat" as he melted. I was somehow comforted, being surrounded by a part of my friend. The water level rose until I was totally surrounded. All that poked from the water was my very top. After a long time, plants started to grow all over, above and below the water. There were so many different forms of life, I could not believe it. Ducks and geese paddled around and fed on the young plants. Muskrats and beavers worked tirelessly. Dragonflies buzzed. Birds swooped. Fish darted about. It all kept me very amused. Human beings traveled about. They preferred this place. This place offered them food and shelter, just as it did everything else that lived here. They harvested many kinds of plants like the birds and animals. They hunted deer like the wolves. They fished like the Great Blue Heron. They lived and fit-in really well in this place. But somehow I knew that they were different. Not different like chickadees from owls, or that they had two legs. They were better than the beaver at changing their homeland to fit their needs.

One day a canoe filled with two-legged humans glided past me. At first I took no notice, but something caught my attention. They looked, dressed, and spoke differently than the people that lived here. As I listened, I learned that these people were from my old home in Canada. They called the time 1700, and spoke of this place as "The big marsh". I figured that there must be many places like where I lived. More and more of these different two-leggeds came. I found them to be similar in ways, but very different in others. Many of these people were like the beaver, changing the land to fit their needs. But unlike the beaver and the ones here before them, they didn't really fit in as well. They had a different way of thinking. They had big plans for this land and a severe way of dealing with anything in their way. In the way that my friend had gone from this place, I watched the original two-leggeds slowly disappear to far-off lands.

In the mid-eighteen hundreds, they made this big place around me a "state" called Wisconsin. Shortly after that, I heard many of them calling my wet home, "wasted space, where only sickness and mosquitos are born". It seems they wanted to take out the water and do something else with the land. Not everyone felt this way though. In 1937 a group that saw waterfowl populations in trouble due to habitat destruction began to protect land important to ducks, geese and many other water- birds. They knew that if they protected the land, they would protect the things that depend on the land. In the mid-nineteen hundreds, a group of people called these places "important", and "special". They started to preserve and protect them. They saw the value of wetlands as what they were, instead of what they could change them into (farm fields, housing areas, etc.). Even with their efforts, the filling and draining of these beautiful places continued. By 1970, we were loosing 458,000 acres every year. More than half of the U.S. wetlands were gone by now.

I was just sitting there remembering the past. Suddenly, I heard a loud noise and felt a nudge from behind. I turned expecting to see my old ice friend. Instead I saw only cold steel. It moved faster and was rougher than my friend. It was not even polite enough to talk to me. The year was 1987, one year before the "No net loss" idea. That was when president Bush pledged to help protect all remaining wetlands. It was too late for my home. They were removing water (draining) and adding dirt (filling). The water started to smell like oil and gasoline (contamination). When they found me, someone yelled, "Hey, save that boulder. It's rose quartz. It'll be worth a ton for landscaping!" I tried to explain that I weighed more than a ton, but nobody was listening.

From the time that I first saw those people from Canada until now, seems like only moments to me. Yet so much has changed. I can't even begin to describe it. Today 75% of the original wetlands are gone in the state, with 500,000 acres vanishing nationally every year. The time that I have spent here, has taught me a lot. It's filled with so much emotion. That's what it's like for those of us who last so long.

Wetland Time line Worksheet

10,000 years ago---- _____

1700---- _____

1848---- _____

1850---- _____

1937---- _____

1951---- _____

1970---- _____

1988---- _____

Today---- _____

Complete the time line by reading "When Push Comes to Shove", and placing the letter of an event below into the space provided to the right of the appropriate year.

A. Ducks Unlimited Organization begins process of conserving 6.1 million acres of U.S. wetlands.
B. Wetland loss of 458,000 acres per year. 54% of U.S. wetlands gone. 99 million acres left in lower 48 states.
C. Wisconsin becomes a state on May 29th.
D. National Wetlands Policy Forum formed. "No net loss" idea introduced.
E. Early explorers entered Wisconsin, calling it "The great swamp". 10 million acres or about 1/4 of the state is a wetland.
F. Nature Conservancy Organization formed, presently responsible for saving 5.5 million wetland acres in U.S., Canada, and Central America, and 47,000 wetland acres in Wisconsin.
G. U.S. Swampland Act calls wetlands "Disease producing nuisances" and promotes draining and filling.
H. 75% of original wetlands gone in Wisconsin, 90% in Southern areas of the state.
I. The glaciers retreated.

1. What was the main character in the story? Why was this a good viewpoint from which to view history?

2. Are there periods of the time line that represent sudden increases in wetland development? Why?

3. Are there periods where peoples thoughts about wetlands changed? If so when?

Wetland Time line Answer sheet

10,000 years ago---- **I**

1700---- **E**

1848---- **C**

1850---- **G**

1937---- **A**

1951---- **F**

1970---- **B**

1988---- **D**

Today---- **H**

Complete the time line by reading "When Push Comes to Shove", and placing the letter of an event below into the space provided to the right of the appropriate year.

A. Ducks Unlimited Organization begins process of conserving 6.1 million acres of U.S. wetlands.
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G. U.S. Swampland Act calls wetlands "Disease producing nuisances" and promotes draining and filling.
H. 75% of original wetlands gone in Wisconsin, 90% in Southern areas of the state.
I. The glaciers retreated.

1. What was the main character in the story? Why was this a good viewpoint from which to view history? **A rose quartz boulder. Because rocks are around for a long time.**
2. Are there periods of the time line that represent sudden increases in wetland development? Why? **Yes. 1848-Stateship, 1850-Swampland Act, 1970-Loss of 458,000 wetland acres/year.**
3. Are there periods where peoples thoughts about wetlands changed? If so when? **Yes. 1937-D.U., 1951-Nat.Conserv., 1988-N.W.P.F. (No Net Loss).**

THERE WAS NO PLACE LIKE HOME

PURPOSE

The purpose of this activity is to demonstrate the effects wetland loss has had on waterfowl populations.

METHOD

Students take part in an interactive game that simulates the effects of wetland habitat destruction over time.

CONCEPT

Wetland habitat destruction can drastically affects wildlife populations.

OBJECTIVES

The student will be able to: 1) generalize the historical loss of wetlands, 2) describe the affects of wetland habitat loss on wildlife populations, and 3)project future outcomes based on past trends.

SUBJECTS

Geography, History, Math, Science, Social Studies.

SKILLS

Analysis, Comparison, Hypothesizing, Inferring, Predicting, Problem Solving.

MATERIALS

*** Cut-outs of four "Northern states" (Wisconsin, Iowa, Illinois, and Nebraska):**

*** Cut-outs of four "Southern states" (Louisiana, Arkansas, Mississippi, Alabama)**

*********SEE BOX ON STATE CUT-OUTS*** ********

TIME CONSIDERATIONS

One 50 Minute Period.

EXTENSION

Ask a member of the local Ducks Unlimited chapter, Wisconsin Waterfowlers Assoc., or other organization to talk about their role in protecting wetlands.

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BACKGROUND

If there is one single most damaging influence to the natural world, it is surely habitat destruction. Any working definition of habitat must encapsulate all those things necessary for the well-being of the organisms within it. Due to the overlap in habitat preference between different organisms, alterations to or destruction of habitat exerts influence over great numbers of living things. A graphic example of this is the drastic reduction of wetland nesting habitat for waterfowl, and its resultant outcome. The reasons for, and means of habitat destruction are varied, but the result is simple. Less habitat means a reduction in numbers and diversity of organisms. In Wisconsin, we have lost roughly 75% of the original wetlands in the state. Iowa has lost a staggering 99%. With loss statistics like these, "Home Sweet Home" is only a memory for many living things that depend on wetlands.

PROCEDURE

1. Select a large playing area about 70 feet long and 30 feet wide. Place the extra-large cut-outs of the Northern states at one end and the cut-outs of the Southern states at the other. Designate the Northern states end of the field as the "nesting habitat", and the Southern states end as the "wintering habitat".

2. Explain to the students that they are ducks and will migrate between these two areas at your signal. Tell them that the state silhouettes represent the available wetland habitat in each state. As the ducks complete their migration across the field, they are to go to a state and place one foot around the outside of the state. Students must have half of their foot on the silhouette. If they cannot get at least one-half of their foot on the state, this means that they couldn't find suitable wetland habitat. These ducks "die" and will sit on the sidelines to watch. The populations after each return migration to the Northern states can be recorded and graphed if desired. During the migrations between the Northern and Southern states the "ducks" should fly flapping their "wings" and quacking.

3. Each time the "ducks" migrate back and forth from South to North and back again, this represents a change in time, which will be noted on the Northern states. Each time they return to the "North", they should find that a smaller state silhouette with a new date has replaced the larger one of the previous

trip.

4. Begin the activity with the ducks on the Southern wintering habitat, arranged on the states as described earlier. Announce the start of the first migration. Have the students migrate in slow motion until they become familiar with the process. Then they can speed up. On the first try all the birds should successfully migrate to the Northern nesting habitat. Tell them that the year is 1700, as marked on the state, and there is plenty of wetland habitat for ducks at this time. The Native Americans who lived in these states did not greatly alter or destroy wetland habitat, and these areas were just beginning to be explored by non-native people. Have the "ducks" migrate back to the Southern states.

5. Replace the "Extra Large" Northern states marked 1700 with those marked 1850, the "Large" size. Explain to the students that the year is now 1850, and many settlers have begun to drain and fill-in wetland areas for farmland and places to live. Tell them that the usable wetland habitat available is smaller and they will discover what that means to ducks. Have the students "migrate" to the Northern states. Depending upon the number of students they may "scrunch" on. Some of them will not be able to fit and will "die" and have to sit out. Explain at this time that each student actually represents hundreds of thousands of ducks. Tell them that combined students on a particular state represent all the ducks that use wetland habitat in that state. Because of the shrinking wetland habitat, more ducks have to use what's left. Some ducks will not find what they need and die. Instruct students to "fly" back to the wintering habitat. The Southern states will remain the same size throughout the game. Ask the students what this might tell them about the proportional amount of wetland destruction in the South, and the availability wetland habitat there. Louisiana, for example has a vast number of wetlands, and development of these has not even been close to the scale of destruction in the North.

6. Once again, replace the Northern states with the smaller size, and inform the "ducks" that it's 1945. WWII has ended, and the country is in a period of rapid growth and expansion. Wetlands are being destroyed at rapid rates and it's going to get "tight" in the Northern areas. Again tell the students to "Go North!". You may have to make rulings on sneaky "Ducks" trying to squeeze into states on the other end. After the "toll has been taken" and recognized, send them back South.

7. Replace the Northern states with the "itti bitty" silhouettes that now represent all that's left of our once vast wetlands. Tell the ducks to migrate North without explaining the year or circumstances. Only one duck should fit on each of the four states in the nesting areas. All the rest should sit down in a group. Have the four remaining students bring their states and stand in a line in front of the large group. Hold up the 1700 silhouette of each Northern state and compare it to the size of the present one. Give examples of current statistics, for what percentage of wetlands have been destroyed in each state (IA=99%, WI=75%). What does this trend mean to waterfowl and other living things that use or live in the marsh? How long will it be before we have no more wetlands? What will this do?

8. An optimistic ending to this activity is to replace the smallest Northern states with a larger one in one final round. This represents the reclaiming and replacing of wetland areas, and would truly be an encouraging occurrence. The state of Iowa is currently reclaiming 800-1000 acres per year, and has begun the long process of attempting to replace much of the states original wetland habitat. Have the remaining four return to these larger states. Tell the students that creating more habitat has allowed waterfowl populations to increase. Place students on the states to represent their new waterfowl capacity. Discuss how increasing available food, water, shelter, and space (habitat) in nesting areas will increase duck populations and plant and animal life. Several organizations and agencies are currently working to reclaim wetlands. Ducks Unlimited and Nature Conservancy have purchased hundreds of thousands of acres of wetlands. Both state and the federal government require duck stamps to hunt. Proceeds from stamp sales are used for wetland reclamation and protection. Discuss what sort of things we can do to help preserve or reclaim wetlands. Discuss how students can join organizations or buy a duck stamp. (You don't have to hunt to buy a duck stamp. They can be purchased at any U.S. Post Office). Discuss potential trade-offs, problems, and things we may have to give up to achieve this. The process of wetlands reclamation is a long and arduous one, but it's a "pay me now or pay me later" proposition. Now is the time, before they're all gone.

MAKING STATE SILHOUETTES

Make an overhead transparency of the included state silhouette master. Project the states to the proper size, and trace.

Northern States: Trace one size "extra-large" of each state (18" on the longest vertical or horizontal dimension) with the name of the state and 1700 written on it, one "large" of each (13" on the longest dimension) with the state name and 1850 on it, one "medium" of each (10" on the longest dimension) with the state name and 1945, and one small of each (6" on the longest dimension) with the state name and "TODAY". You should end up with 16 state silhouettes, four of each size category.

Southern States: Only size "extra large" (longest side 18") of each state with the state name on it.

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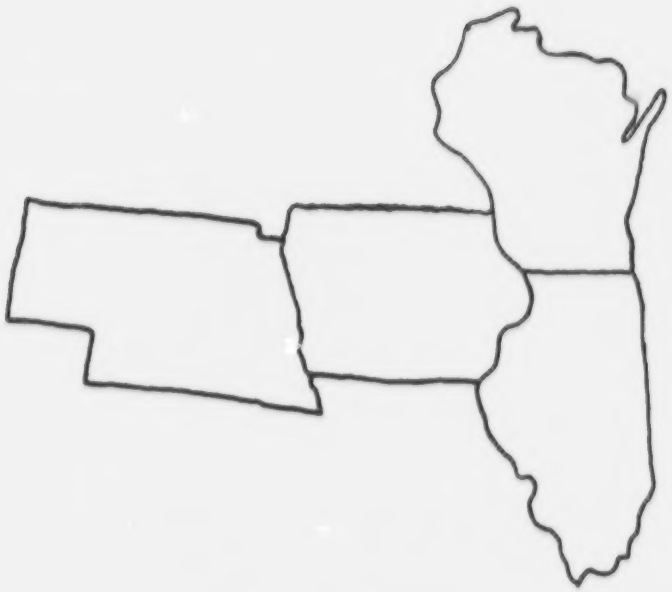

The Boggsville Maxi Mart-- There Ought to be a Law Against It

PURPOSE

The purpose of this activity is to examine the laws protecting wetlands and the processes involved in utilizing them to protect wetlands.

METHOD

Assigned roles in a wetland controversy, students will analyze wetland laws and regulations, take part in the processes involved, build defenses for their position, and participate in a simulated public hearing.

CONCEPT

Legal processes play an important role in wetland protection issues.

OBJECTIVES

The student will be able to: 1) describe and evaluate wetland laws and regulations, 2)identify the agencies involved, and 3) demonstrate the citizen's role in wetland protection.

SUBJECTS

Language Arts, Social Students, Government.

SKILLS

Analysis, Application, Communication, Comparison, Evaluating, Listening, Problem Solving, Public Speaking.

MATERIALS

***Personal Data Cards**

***Copies of "Legality Research Form" for each team.**

***Copies of "Simplified Wetlands Regulatory Handbook" for each student.**

***Copies of "Public Hearing Testimony Outline" for each student.**

TIME CONSIDERATIONS

Two to Three 50 Minute Periods.

BACKGROUND

Government has played and continues to play an important hand in the future of wetlands. Two years after Wisconsin became a state, the Swampland Act paved the way for a legacy of wetland destruction. Wetlands were perceived as nuisances. As a result, laws and government programs helped drain and fill 75% of Wisconsin's wetlands. Tax dollars were spent to subsidize reclamation projects. As late as the 1960's, farmers could receive up to 75% of the cost of draining wetlands back from the federal government. Laws, regulations, and governmental programs helped modern civilization carve an "eminent domain" out of the wilderness.

During the late 1960's and early 1970's, some people began examining "progress" and the toll it had paid on the environment. The first Earth Day movement brought an initial wave of environmental consciousness and some initial protection legislation. Congress in an effort to "restore and maintain the chemical, physical, and biological integrity of the nations waters",passed the Clean Water Act in 1972. Although wetlands were not specifically mentioned, they received minimal protection as part of the nation's water resources. Section 404 of the Clean Water Act regulates the fill or disposal of dredged material in a wetland, but does nothing to regulate draining, excavation, or flooding.

Under the Act, projects affecting wetlands must apply for a Section 404 permit. Permits are reviewed and issued by the Army Corp of Engineers. Veto power over Corp decisions were reserved for the Environmental Protection Agency. How successful was this initial legislation? At best, it was a start. During the past twenty years, 10-14,000 permits were requested annually; only 3-5% were refused.* During this period 50,000 acres were saved annually by the process, while 500,000 acres were lost each year.**

In more recent years, the battle for fragile areas have shifted from the federal to the local arena. Section 401 of the Clean Water Act gave states the power to regulate wetland projects through the State Water Quality Certification Process. Wisconsin has added several laws that regulate wetlands projects at a state, county, and

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local level. (See "Simplified Wetland Regulatory Handbook")

Even with further regulations, the threat to wetlands is not over. Small wetlands continue to be altered without notice. Regulations often don't protect wetlands from all perils. Enforcement measures are often paralyzed by large agency and court caseloads. An even larger threat is a movement started during the Bush Administration to change how wetlands are delineated. Small changes in how wetlands are defined will open up millions of acres to development. These subtleties are not realized by most citizens and therefore represent a great threat to wetlands. Consequently, it is increasingly important that citizens understand the laws and regulations affecting wetlands and their individual role in due process.

*Merrimac, Kristin, "War on Wetlands", Outdoor America, Summer 1991.
**"Audubon Adventures", National Audubon Society, April 1990.

PROCEDURES

1. Read aloud to the class, the Boggsville Controversy Summary.

BOGGSVILLE CONTROVERSY SUMMARY

Land use decisions affecting wetlands have become a familiar issue where business developments are concerned. The following is an imaginary conflict that corresponds to many real life dilemmas.

Boggsville, a city of 9000 people, is well known for its marsh. Every year, thousands of people come to Boggsville to watch migratory waterfowl. Adjacent to the marsh, within the city limits, is a 60 acre plot of wetland for sale. Maxi-Mart, a department store, is considering buying the property to construct a store that will provide 150 new jobs. To do this, Maxi-Mart will have to fill 20 acres of the plot for the store and parking lot. Local citizens are divided on their feelings toward the project. Two sides have emerged and are working hard for their cause. The job of each group is to review the laws and regulations affecting this project and take appropriate action.

2. Distribute Boggsville controversy role cards to your students. Tell your students that they are involved in this wetland controversy and must choose sides on the issue based on the role card they were given.

3. Group the students into two separate sides of the Boggsville issue. To do this, have students who represent interests for building the "Maxi-Mart go to one corner of the room and those that are against, go to another corner of the room. Each group represents citizens on opposing sides of the issue.

4. Distribute "Simplified Wetlands Regulation Handbook" to each student and "Legality Research Forms" to each group. Tell the students that they must research the laws and regulations that apply to wetlands. Their job is to decide what actions must be taken to solve the controversy based on the laws that govern them. Have them utilize the "Legality Research Form" as an organizer of information to research. Answer sheets for both sides are provided, so you may help them with an example. Students may be divided into further small groups to increase student participation.

5. Once each group has done their research, discuss which laws, regulations, or programs apply to the situation and why. Ask the students what specific actions need to be taken on each side. As will come out in the discussion, four separate laws need to be addressed. Tell your students that because of the time involved in permit processes and public hearings, developers normally start the process related to each law at one time.

6. Hand out copies of "Public Hearing Testimony Outline". Tell your students that they will be taking part in one of the processes. During one of the next class periods, they will participate in a NR 117 public hearing to rezone the property to commercial. Each of the team members will prepare testimony as to why the area should or should not be rezoned. Have the students utilize the "Testimony Outlines" to organize their thoughts.

7. Convene the public hearing in your classroom. Have each student add their name to a list of speakers. Have the zoning board call the hearing to order. Allow the property owner to speak first, requesting the rezoning of his/her property. Next have Maxi-Mart speak on the project. After the completion of this testimony, invite public comment from each of the citizens in the order that they signed up. After hearing all testimony, the zoning board will recess for a short time and then give their decision to the class.

8. Discuss with the students the following questions. What were the better points brought out in the testimony for the project; against? On what points did the board make their decision? How did it feel to be on the board, with friends giving testimony? There appears to be many laws and regulations to protect wetlands. Why is it that so many continue to be lost? (Answers include: lack of adequate enforcement (case overload), people going ahead on small projects without anyone noticing, laws that don't cover every situation such as draining or smaller size parcels, human attitudes based on a lack of understanding.) Discuss why it is very important that more people understand the importance of wetlands and be aware of the laws that regulate them.

PERSONAL DATA CARDS

Cut a part and distribute to students.

LEESA OLSEN, (REALTOR & BOGGSVILLE ZONING BOARD MEMBER).
You started your business in Boggsville five years ago. Your business is doing well, but you have difficulty relating to the "old timers" like Henderson. Your real estate company is not developing this property. You have some questions regarding the credibility of the developer, but you generally vote in favor of development.

BOB HENDERSON, FARMER & CHAIRMAN, BOGGSVILLE ZONING BOARD).
You own and operate a large farm near the south edge of town adjacent to the 60 acre plot in question. You have been interested in the possibility of buying the land to add to your family's agricultural operations. You have a keen interest in the environment, making efforts to employ agricultural practices that benefit wildlife and minimize damage to other natural resources.

ELMER WILLAS, (RESIDENT & BOGGSVILLE ZONING BOARD MEMBER).
You are a 68 year old "old timer" that has lived in Boggsville for over 50 years. You live just 1/2 mile down the road from the marsh. Over the years you have hunted the marsh for deer and waterfowl. This is the land where you and your grandchild go hunting.

DAVID DRESSER, (CORPORATE PRESIDENT).
You are 46 and president of Maxi-Mart Corporation. You would like to build a store in Boggsville. There is a real need for a department store. Not only will the store provide more property tax dollars, but will also provide 150 jobs within the community. This would be an economical benefit for the people of Boggsville.

STEVE AND JANE PINICK (2 people), (LANDOWNERS).
You are retired business people in your 60"s. You own this 60 acres of prime marsh land. You want to sell your land, move to Florida, and live happily ever after under sunny skies. You want cash You believe your asking price is very reasonable.

GLADYS CROW, (BANKER).
You are 50 years old. You are willing to finance the loan for this piece of land. In your free time you love bird watching, hunting, and fishing. You are concerned about protecting environmental quality, but business is business.

MARTY HIGGINS, (DEVELOPER).
You are a big time developer in the area. You have been asked by Maxi-Mart to head the construction project. You have been criticized in the past by the people of Boggsville for a record of carelessness and lack of attention to detail.

JOE WAHOSKE, RANDY SLATER, AND SHAWN GALLINULE, (THREE REPRESENTATIVES OF BOGGSVILLE ROD AND GUN CLUB).
You are all in your mid-thirties and are avid hunters and anglers. You all have children. Hunting has always been an important family activity. You are influential members of Ducks Unlimited. The 60 acres proposed for development contains one of the prime duck hunting areas close to town. You were asked by the Boggsville Rod and Gun Club (62 members) to be their representatives at the town hearing. You express the clubs' concern for the depletion of this resource.

MARY BENNETT, (PRESIDENT OF CHAMBER OF COMMERCE).
This is your tenth year as president of the Chamber of Commerce. You own a grocery store in the middle of town. Your greatest concern is the weak business climate in your community. The Chamber recently hired Smith & Wittigen, a business consulting firm, to evaluate the retail potential of Boggsville. Their findings indicate that the business community could use a department store. You have also wondered about possible ways to improve the economy through increased tourism.

JADE SPARROW, (LOCAL AUDUBON PRESIDENT).
You represent over 200 active Audubon members, and are director of the annual bird count. You kno that eight rare bird species are found in the marsh You are also a school teacher, and annually take your students to visit the marsh.

FRANK PITTS, (UNEMPLOYED RESIDENT).
You are 21 years of age. You are currently unemployed because of the lack of jobs available in your community. You have 2 children and a spouse. Your rent is three months behind. You risk the chance of being evicted. You need a job. Maxi-mart will provide you with a low, but steady income.

GREG KRAMER, (DNR).
You are hired by the state to protect the resources, including all wildlife. You have some concerns about the development of this store in this area and the impact on the water quality, vegetation, and wildlife. You offer a suggestion that they build elsewhere.

WILMA TWOBULLS, (NATIVE AMERICAN LEADER).
You have an interest in the sanctity of the area in question. It is an ancient ceremonial site for your tribes-people. You are just finding out more about the history of your people that once inhabited the marsh area.

INGRID WILHELM, (COLLEGE PROFESSOR).
You teach at a nearby community college. Your botany class uses the site for their plant identification survey. This is the best location for the study, as there are examples of every plant species found in the marsh.

RUSS WINKELMANN, (MEMBER OF NORTHERNS UNLIMITED ORGANIZATION).
You are a very outspoken member of the community. The proposed action threatens the spawning ground of the northern pike that thrive in the marsh. You fish all the time, and northerns are your favorite gamefish.

SANDY VANDYKSTRA, (RESIDENT).
You are an electrician in Boggsville. You can't understand what all the "hoopla" is about. You feel that it's only 20 acres, and can't see why the land is wanted by anyone. If they want to build on it, and the Pinick's want to sell, that's what should happen.

WILLIAM DOBSON, (REPRESENTATIVE OF THE NATURE CONSERVANCY).
Your organization has been very interested in purchasing the property, and has been waiting for this chance. You are very opposed to development, and want to save the land. This includes limiting public activities like hunting and fishing, which don't fit into the idea of preservation.

NORMAN THEOPOLOS, (RESIDENT).
You are a 39 year old with "weather knees" (a condition which causes knee pain during periods of unstable barometric pressure). You live near the proposed building site, and if this plan went through you would not have to go all the way across town to buy groceries. You are in favor of the Maxi-Mart proposal.

CAROL GOLDSMITH, (LEADER OF BOGGSVILLE KAWASAKI SNOWMOBILE RACING CLUB).
Your club has spent years building a network of snowmobile trails around and through the marsh. You have just completed the process of replacing old signage, and invested a lot of money in a map sign at the trailhead. You are only concerned with how the proposed building plan would affect your club and snowmobilers who visit. You are against anyone owning the land who will not allow full public access.

ROTHCHILD MERRIWHETHER III, (MEMBER OF THE BOGGSVILLE LITERARY SOCIETY).
Members of this elite group of literary connoisseurs meet at the marsh over-look at sunset on Tuesday nights. The tremendous view of the marsh from this location, with the sun setting behind it, allows them to "experience new heights of poetic fervor". Any plans to spoil this scenic location (which the Maxi-Mart would totally cover) would be met with "much disdain".

WINEFRED JONES, (RESIDENT).
You live on the adjoining property to the North of the marsh. You want all bodies of "stagnant, smelly, disease bearing, mosquito infested water" to be drained right now. "That scum hole," as you refer to the marsh, "has caused me many a sleepless night from the mosquitos and that sick wind" when the breeze blows out of the South.

JOHN FORD, (RESIDENT AND OWNER OF THE ROCKIN' T RANCH).
You own marsh property on the opposite side of the Boggsville Marsh from the proposed building site. You have wanted to drain and convert your property to pasture for years. You are going to take this opportunity to sway the zoning board into allowing marsh development, and see if you can squeak through too. You are going to fight for the Pinnicks, but with your own motives in mind.

SIMPLIFIED WETLANDS REGULATORY HANDBOOK

NR 115...SHORELINE AND WETLANDS ZONING

Agency in Charge: County Zoning

Refers to: All areas in the county not part of a city or village.

Summary: All wetlands 5 acres or larger that are within 300 feet of a river or stream or 1000 feet of a pond or lake are zoned as wetlands. Areas zoned as wetlands can not be built on, filled, ditched, or drained. People wanting to change a wetland must ask to have the wetland rezoned. Wetland rezoning requires a public hearing. A zoning board made up of local people hears testimony of local citizens. Decisions to rezone are based on points brought out in the hearing. Wetlands can not be rezoned if the project would cause changes in:

1)storm & floodwater storage capacity
2)shoreline erosion protection
3)fish spawning, breeding, or feeding grounds
4)wildlife habitat
5)areas of special recreation, scenic, or scientific interest

Any or all of these points should be a part of a citizen testimony. Decisions to rezone may be appealed by the WI DNR.

NR 117...SHORELINE & WETLAND ZONING

Agency in Charge: City or Village Zoning

Refers to: Areas within a city or village.

Summary: Same as NR 115

CHAPTER 30...WISCONSIN NAVIGABLE WATER PROTECTION

Agency in Charge: Wisconsin Department of Resources

Refers to: Lakes, ponds, streams, rivers, and wetlands with large areas of open water anywhere in Wisconsin.

Summary: Chapter 30 regulates filling, ditching, or draining of lakes, ponds, streams, rivers, and some large wetlands. Persons wishing to change these areas must apply for a permit. When the DNR receives the application, it is reviewed by fisheries, water regulations, wildlife, and engineering staff. If these staff feel the project would harm any of their areas, the project is denied a permit. If the project is granted, the public can appeal the decision through a public hearing.

US CLEAN WATER ACT

Agency in Charge: US Army Corp of Engineers (issue permits), US Environmental Protection Agency (review permits, can veto Corp decision, & enforcement)

Refers to: All wetland areas, irregardless of size or location.

Summary: **SECTION 404**...Persons wishing to fill, build dikes, or move soil within a wetland, must have a permit. The Army Corp of Engineers issues the permit. Someone has to apply for the permit by filling out an application. The Corp must give notice to the public of the permit application in the local newspaper. Citizens have 30 days to send written testimony to the Corp or request a public hearing. The Corp must consider public input, input from agencies like the DNR & US Fish and Wildlife Service, and conduct an environmental review. Factors that the Corps will consider are:

conservation - economics - aesthetics - environmental concerns - fish & wildlife - flood control - public welfare - historic value - recreation - water supply - and more.

The Corp decides whether to grant or deny permits based on the information presented. If the Corp has decided to grant the permit, it must first meet Section 401.

US CLEAN WATER ACT CONTINUED

SECTION 401...Section 401 of the Clean Water Act gives the State of Wisconsin certain powers. Each state sets standards for water quality. A wetland project must pass the State Water Quality Certification Process in order to receive a section 404 permit. In Wisconsin, the law that defines this process is known as NR 103.

NR 103...WATER QUALITY CERTIFICATION

Agency in Charge: Wisconsin Department of Natural Resources

Refers to: All projects affecting the waters and wetlands of the state.

Summary: Persons wishing to alter a wetland must meet state water quality standards. In order to meet these standards, the person must prove 2 things: 1)no practical alternative exists and 2)the project will not seriously affect the wetland. If a project can be built somewhere else, it has an alternative. If a person can not prove both, the project does not meet standards. Without, the project will not be able to receive a section 404 permit.

US FOOD SECURITY ACT OF 1985...Swampbuster Provision

Agency in Charge: ASCS...Agriculture Stabilization Conservation Service

Refers to: Wetlands that have been drained or filled for farming since 1985.

Summary: Many farmers receive payments from the government for not over producing crops. The Swampbuster Provision does not allow anyone who has drained or filled a wetland since 1985 to receive these payments.

US MIGRATORY BIRD CONSERVATION ACT

Agency in Charge: US Fish and Wildlife Service

Refers to: Requires all migratory waterfowl (ducks and geese) hunters to buy a Federal Duck Stamp.

Summary: In response to loss of wetland habitat for wildlife, hunters are required to buy a Duck Stamp each year. Money raised from this is utilized to purchase and manage wetland properties. Any citizen, whether they hunt or not, can support wetlands by buying a stamp.

LEGALITY RESEARCH FORM

Case: BOGGSVILLE MARSH VS. MAXI-MART

Mission: to stop the development of Maxi-Mart

LAW	AGENCY INVOLVED	DOES LAW APPLY? WHY, WHY NOT?	ACTION TO TAKE
NR 115 Shoreline and Wetland Zoning	County Zoning	No, Boggsville Marsh is withing the village of Boggsville	NONE.

LEGALITY RESEARCH FORM

Case: BOGGSVILLE MARSH VS. MAXI-MART

Mission: to insure the development of Maxi-Mart

LAW	AGENCY INVOLVED	DOES LAW APPLY? WHY, WHY NOT?	ACTION TO TAKE
NR 115 Shoreline and Wetland Zoning	County Zoning	No, Boggsville Marsh is within the village of Boggsville	NONE.
64			65

LEGALITY RESEARCH FORM

Case: BOGSVILLE MARSH vs. MAXI-MART

Mission: TO stop the development of Maxi-Mart

LAW	AGENCY INVOLVED	DOES LAW APPLY? WHY, WHY NOT?	ACTION TO TAKE
NR 115 shoreline & Wetland Zoning	County Zoning	NO, Boggsville Marsh is within village of Boggsville	NONE
NR 117 shoreline & Wetland Zoning	Boggsville Village Zoning	YES, Boggsville Marsh is in Village	Attend the local zoning board meeting and express your opposition.
CHAPTER 30 WI NAVIGABLE WATER	WI DNR	Yes, Boggsville Marsh is Navigable & Maxi-Mart wants to Fill	If the project is granted, the Public can request a public hearing conducted by the DNR.
US Clean Water Act Section 404	US ARMY CORP OF ENGINEERS	YES, Permit needed to Fill any wetland	WRITE The Corp within 30 days of notice. Voice opposition in the letter. Request a public hearing.
NR 103 WATER QUALITY CERTIFICATION	WI DNR	YES, Maxi-Mart wants to Alter wetland	NONE
US FOOD SECURITY ACT of 1985	ASCS Agriculture Stabilization Conservation Service	NO, ONLY APPLIES TO Agriculture	NONE
US Migratory Bird Conservation Act	US FISH & WILDLIFE SERVICE	NO, Doesn't have anything to do with issue	NONE

LEGALITY RESEARCH FORM

Case: BOGSVILLE MARSH vs. MAXI-MART

Mission: TO INSURE THAT MAXI-MART IS BUILT ON MARSH PROPERTY

LAW	AGENCY INVOLVED	DOES LAW APPLY? WHY, WHY NOT?	ACTION TO TAKE
NR 115 Shoreline & Wetland Zoning	County Zoning	No, Boggsville Marsh is within Village of Boggsville	NONE
NR 117 Shoreline & Wetland Zoning	Boggsville Zoning Board	Yes, Boggsville Marsh is in the village	Must ask to have wetland rezoned. Provide testimony at the Zoning Board hearing.
CHAPTER 30 WI NAVIGABLE WATERS	WI DNR	Yes, Boggsville Marsh is navigable & Maxi-Mart wants to fill.	MUST Apply for a permit. Be prepared to offer testimony if a public hearing results.
US CLEAN WATER ACT SECTION 404	US Army Corp of Engineers	YES, Maxi-Mart wants to put fill in the marsh.	Must apply for a permit. Be prepared to offer testimony if a public hearing results.
NR 103 WATER QUALITY CERTIFICATION	WI DNR	Yes, Maxi-Mart will alter a wetland.	Must apply for certification. Must prove that project will not seriously affect a wetland and no other options
US FOOD SECURITY ACT - 1985	ASCS	NO, ONLY APPLIES TO AGRICULTURE	NONE
US Migratory BIRD CONSERVATION ACT	US FISH & WILDLIFE SERVICE	NO, Doesn't have anything to do with issue.	NONE

PUBLIC HEARING TESTIMONY OUTLINE

Name of Citizen:

Occupation or Standing in the Community:

Reason Citizen is Involved in Controversy:

Reasons Why or Why Not to Rezone Property:
1)

2)

3)

more)

I CAN MAKE A DIFFERENCE

PURPOSE
The purpose of this activity is to demonstrate that individuals actions can make a difference.

METHOD
After a discussion of environmental action categories, students will brainstorm wetland preservation actions and formulate a classroom project.

CONCEPT
Informed people have the power to initiate action in wetlands protection.

OBJECTIVES
The student will be able to: 1) list five environmental action categories, 2) generate a list of specific actions to preserve wetlands, and 3) participate in a wetland class project.

SUBJECTS
Language Arts, Social Studies, Art.

SKILLS
Analysis, Application, Classification, Communication, Evaluation, Problem Solving, Research, Synthesis, Writing.

MATERIALS
*Dry marker board, chalk board, or flip chart.

GLOSSARY WORDS
None.

TIME CONSIDERATIONS
Two to Three 50 Minute Periods.

BACKGROUND
Decision making and personal choice represent the greatest power people have to initiate change. Yet today, that personal choice is often oriented to "looking out for number one". In today's fast paced society, many of our decisions are directed toward short term benefit. As a result, we often feel totally powerless regarding long-term issues like environmental protection. This powerless feeling is a self-fulfilling prophecy, easily rationalized by the number and scope of environmental threats currently facing us. An individual's daily personal choices and actions can have a spreading and combined effect just as powerful as the problems they address.

There are five environmental action categories used in clarifying strategies for positive action. They are:

Persuasion: trying to convince others that a certain course of action is best. Examples: writing a letter to the editor; expressing your opinion at a meeting.

Consumerism: buying or not buying a product as a statement of one's philosophy toward the product or the maker of the product. Examples: refusing to buy soda in non-recyclable bottles; boycotts; buying products made by companies trying to reduce pollution.

Political Action: any action that brings pressure on political or governmental agencies in order to persuade them to take positive action. Examples: writing or phoning elected officials; voting for or against certain issues or candidates; attending a public hearing.

Ecomanagement: any physical action taken with respect to the environment. Examples: planting trees; building and installing birdhouses; helping a private agency raise funds to buy and preserve a piece of land.

Legal Action: any legal or judiciary action taken which is aimed at some aspect of environmental law enforcement. Examples: law suits, injunctions.

PROCEDURE
1. Discuss with your students how people can make a difference in solving problems.

2. Introduce and define the five action categories. Have students add examples they can think of to strengthen their understanding of these strategies.

3. With your class, brainstorm a list of specific things you can do individually or as a class under each category heading.

4. Choose one or several actions that you could do as a class summative project in the area of wetland education and preservation.

Some project possibilities might include:

·a wetland mural in the school hallway or lunchroom to help other students learn about wetlands

·a letter writing campaign to local/state legislators and the President supporting wetland preservation and reclamation legislation

·a fund raising campaign for adoption of a wetland area, for a class membership in Ducks Unlimited or the Nature Conservancy, or for the purchase of state and federal duck stamps

·the production of a school wetland newspaper introducing facts and issues to other students, parents, and the community

·adopt a wetland- Watch a wetland throughout the seasons and record changes in a journal.

·the writing of wetland articles or editorials for local newspapers

·and more. Use your imagination, there are many things you can do.

*The important thing is... **to do something**. Remember... YOU represent the last bastion and hope for the preservation and restoration of wetlands. Without you, this whole project isn't worth the paper it's written on.*

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SO WHAT HAVE WE LEARNED ABOUT WETLANDS?

PURPOSE
The purpose of this activity is to document student learning as a result of this unit.

METHOD
Students will brainstorm a list of wetland components and group them into like categories through the process of concept mapping.

CONCEPT
Wetlands are complex ecosystems worthy of our protection.

OBJECTIVES
The student will be able to: 1)list and associate components within a wetland, and 2)identify 3 factors used to define a wetland.

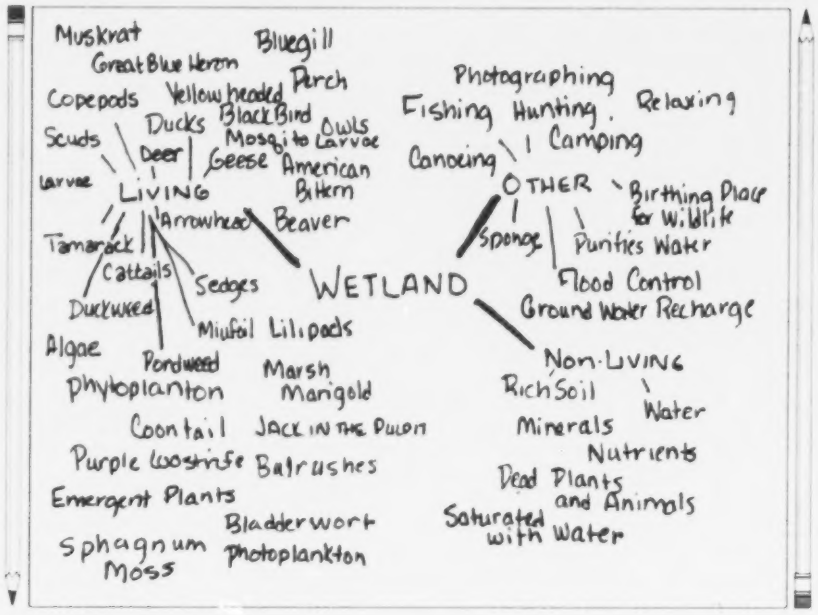
SUBJECTS
Language Arts, Science.

SKILLS
Analysis, Classification, Description, Listing, Matching, Synthesis.

MATERIALS
*Flip-chart, or butcher paper.

GLOSSARY WORDS
None.

TIME CONSIDERATIONS
One 50 Minute Period.



PROCEDURE

1. Repeat the concept mapping exercise used in Lesson 1- WETLANDS- "MORE THAN MUD AND SKEETERS". Continue until students' ideas have been exhausted.

2. Hang the concept mapping example completed in lesson 1 next to the one from lesson 14. Compare and discuss the differences with the class.

3. Review the basic concepts of each lesson in the unit by asking the students the following questions:
   - What are the three factors used to define a wetland?
   - What are the 3 common wetland types in Wisconsin? How and why are these types different?
   - What important functions do wetlands fulfill?
   - Why do wetlands hold such a diverse abundance of life?
   - What are some characteristics by which wetland organisms can be grouped?
   - What are the six wetland value categories, and what are some examples of each?
   - What do the terms belief, value, problem, and issue mean?
   - What percent of wetlands have been destroyed in Wisconsin to date? How long did this take?
   - How does wetland destruction affect wildlife populations? Why are more than one species affected?
   - What part do laws play in wetland destruction and preservation?
   - What kinds of things can ordinary people do to protect wetlands?

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PROJECT WULP FIELD COMPONENT

WHY ARE OUTDOOR EXPERIENCES IMPORTANT?

Well known environmentalists like Aldo Leopold, John Muir, and Sigurd Olson spent a great deal of time in the outdoors as youth. Research on their lives has shown that spending this time in nature was a significant life experience that contributed to their development of an environmental ethic. With the advancement of technology and urbanization, most youth today spend little time in the outdoors. Without some regular contact with nature, where are the Aldo Leopolds of tomorrow going to come from?

Outdoor experiences are an important part of a sound environmental education program. The research sited above demonstrates the need for our youth to have regular visits to the outdoors. If possible, take your class out to a wetland. Let them explore every nook and cranny. Only through this involvement can they truly understand the world around them.

A WETLAND OUTDOOR EXPERIENCE FOR YOUR CLASS

Project WULP was designed to be taught in two options--entirely in the classroom and a combination of classroom and field experience. The activities that follow were assembled to provide your class with a well rounded experience that takes approximately 5 hours to complete.

First Law of Environmental Education:
An Experience is Worth a Thousand Pictures

PURPOSE OF FIELD COMPONENT ACTIVITIES

The purpose of the field component is:
1) To increase student awareness and observational skills,
2) To introduce students to the diversity of wetland organisms,
3) To expose students to "hands on" experiential study of wetland ecology,
4) To facilitate understanding of adaptation to marsh life,
5) To demonstrate the needs and inter-connectedness of wetland organisms,
6) To convey the role of responsible hunting, fishing, and trapping as wildlife management tools, and
7) To increase positive outdoor experiences in the education of young people.

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ACTIVITY 1....20 MINUTES
"HUSH... WHAT'S THAT SOUND... EVERYBODY LOOK WHAT'S AROUND"

In today's fast-paced world, students require time to acclimatize themselves to the outdoors. A good introductory activity must help students "slow down" and become more sensitive to what is happening around them.

PROCEDURE

1. Tell the students that,coming to a natural place from our fast-paced daily lives is a difficult transition for us to make. Our minds expect the same constant barrage of sensory input that we get from television, a kind of "fast-food" approach to viewing our surroundings. With this attitude, at first glance it seems like nothing is happening in nature because things are not always jumping at us and screaming "I'm here, look at me!". If we can slow down to natures unhurried pace, we will see the subtle but continuous events unfold.

2. Bring students to an area well-suited to nature observation, and tell them that they will sit alone quietly for 10 minutes or so and watch for activity.

3. Place students so that they cannot see any classmates, allow them time to make observations.

4. Collect students and have them share what they saw, heard, smelled, etc. with the group.

5. Extension: Have students draw a "sound map" of their area consisting of a rough map with locations or general directions and identifications (if possible) of sounds. This is a valuable awareness activity, and stresses the use of a sense we often neglect.

ACTIVITY 2.....45 MINUTES
WETLAND SCAVENGERS

Individual exploration brings learning to a personal level. A sense of ownership causes the gained information to be valued.

PROCEDURE

1. Choose an area that provides a safe environment for the children to explore, and set boundaries that keep students within sight of the instructor. It is also important to use an area in which students can successfully find the scavenger hunt items (See Wetland Scavenger Hunt Worksheet).

2. Go over the worksheet to make sure that the items are understood, and answer any questions.

3. Divide the students into pairs. Each pair should receive a copy of the worksheet, a pencil, and a clip-board (if available) or something to write on.

4. Tell the students to go out in their pairs, find the items listed on the worksheet, and check them off. Then have them write a brief description of the items in the proper area.

5. Instruct the students that when they have successfully completed the worksheet, they should come and sit quietly in a group at a location chosen by the instructor.

6 Have each pair share their worksheet with the rest of the group, and discuss the variety of findings. It is not necessary to name or know everything. Emphasis should be placed on the description of the item and the diversity of students' answers.

7. Conclude with a discussion of the amazing diversity of life that exists in a wetland. Anyone can learn about wetlands by personal exploration.

WETLAND SCAVENGER HUNT WORKSHEET

Directions- Find examples of the wetland items below, check them off, and fill out the other important information about your discoveries.

Wetland Item	Check	Description
1. A floating plant.	____	_____
2. A large tree near the wetland.	____	_____
3. Signs of muskrat.	____	_____
4. A water-bird.	____	_____
5. An insect that floats.	____	_____
6. A bird's nest.	____	_____
7. Examples of water pollution.	____	_____
8. Mucky wetland soil.	____	_____
9. 1 predator & 1 prey.	____	_____
10. An animal track.	____	_____
11. A singing bird.	____	_____
12. A floating bird.	____	_____
13. A plant with seeds.	____	_____
14. An amphibian.	____	_____
15. A fish's food.	____	_____
16. A flying insect.	____	_____
17. A sign of humans.	____	_____
18. A snail or clam shell.	____	_____
19. An animal's home.	____	_____
20. A beautiful smell.	____	_____

ACTIVITY 3....75-90 MINUTES
WETLAND SAFARI

Students will never forget the things they learn on a field experience. This is due, in part, to the fact that many of the questions they answer are their own. This "hands-on" approach to education gives students the freedom to explore in their own way.

MATERIALS

*Collection equipment, empty ice cream buckets, dish pans, aquatic invertebrate key, ice cube trays, microscopes.

PROCEDURE

1. Discuss safety tips to students before going near the water.
   -Always work with a buddy.
   -When taking samples, do not lean over the water. Distribute your weight by either putting most of your weight on your back leg, sitting down, kneeling down, or laying down. Doing these simple stances will help reduce the likelihood of someone falling in the water.
   -Carry long extension collection nets vertically to help avoid jabbing other people.
   -If the water warrants, use PFD's (life vests) for further safety precautions.

2. Have students work in pairs. Hand out sampling equipment. Each pair should have a sieve and ice cream bucket, (other nets if available).

3. Have students fill the bucket with water (about 3/4 full). Having the water in the bucket will help the students when collecting. The organisms tend to stick to the collecting sieves and nets. By submerging the equipment into the bucket of water the organisms are then released into the bucket.

4. Have students collect organisms that live on and near the bottom, in and near vegetation, in open water, and on the surface of the water. Don't collect a lot of silty mud. It will be difficult to see any organisms if the water is not clear.

5. Have students pour their samples into a white dish pan (organisms will show up better if you have a white background). Ask students to sort out like organisms found within their sample. Ice cube trays filled with water works well to sort the aquatic organisms. Remind the students many of the organisms within their sample are microscopic in size and maybe unable to detect. Have a microscope available for students to use.

After sorting, have the students observe and answer the following question about each organism.
   What color is the organism?
   How big is it? What is its shape?
   How does it move?
   How does it breathe?
   Does it have legs? wings? eyes? mouth?

6. Have students identify the organisms using the aquatic invertebrate key (see Journey to the Bottom of the Pail section for key).

7. Discuss with the students the variety of organisms they saw within their sample. Each organism has a specific role that it plays within a wetland. Discuss with the students that these organisms are a base or foundation for the food web that supports all the other organisms that live within the wetland.

ACTIVITY 4....45 MINUTES
A BEAVER WARDROBE

In order for an organism to survive in any environment, the organism must have the proper adaptations to meet the challenges specific to the environment. The adaptation may be physical (i.e. specific features), or behavioral (how the organism acts). The beaver is an example of an organism which is well adapted to living in a wetland. By using common objects to demonstrate these adaptations, students will gain an appreciation of how beavers are well suited for the environment in which they live.

MATERIALS

*Beaver adaptation props: coat, goggles, nose plug, fins, paddle, oil, comb, axe, no trespassing sign.

PROCEDURE

1. Ask the students for a volunteer to help teach everyone about a remarkable animal, the beaver. Tell her/him to come up to the front.

2. Starting with the first item of the materials list, the fur coat, put each item on the student or have them hold the item. After putting on an item, ask the group what beaver adaptation the item symbolizes. Add to their list of possibilities when necessary, so that each item is explained.

3. At the end of the list, you should have a student sporting full beaver regalia. Discuss with the students the significance of the combined list of adaptations. All of these things are necessary to the beaver's survival, and together they make the beaver a wetland animal. It is amazing to think about the process by which organisms become "well suited" to their environment. Every organism found in a wetland has a list of adaptations needed for survival. Some of these include plants with many air spaces in their roots so they don't drown, fish with a body shape that allows them to swim rapidly through weeds to catch food, and water-insects that can skate across the surface film. The demands of everyday life make all organisms, in form and behavior, what they are.

OBJECT	ADAPTATION	FUNCTION
COAT	THICK FUR	WATER PROOFING AND INSULATION
GOGGLES	CLEAR, THIRD EYELID	HELPS IN SEEING UNDERWATER,
NOSE PLUG	NOSE VALVE	CLOSES NOSE WHEN UNDERWATER
FINS	WEBBED FEET	HELPS IN SWIMMING
PADDLE	FLAT TAIL	RUDDER, FAT STORAGE, WARNING (SLAP ON WATER)
OIL	OIL GLAND	WATERPROOFS COAT
COMB	HIND TOENAILS	GROOMS FUR, AND SPREADS OIL
AXE	TEETH	CUTTING DOWN TREES, EATING (INNER BARK)
NO TRESPASSING SIGN	SCENT GLAND	MARKING FAMILY TERRITORY

ACTIVITY 5....20 MINUTES
WETLAND CONNECTIONS--
THE HUMAN KNOT

This interactive game is designed to demonstrate the connection and inter-dependence of wetland organisms. Participation promotes problem solving skills and positive group process.

PROCEDURE

1. Divide class into even-numbered small groups of six or eight students, and have each group stand in a circle facing each other. Explain that the students of each group represent organisms in a wetland ecosystem. Tell the students that all of the organisms are connected either directly or indirectly, and that change affects everything.

2. Tell the students that to demonstrate these connections, they should reach across to the other side of the circle and grasp their left hands with the left hand of another person. After this is completed tell them now to grasp right hands with someone different on the opposite side of the circle. The idea is to get a tangled mess of arms in the center of the circle.

3. Inform the students that they may not, under any circumstances let go of the hands they are now holding, but that they can re-position their grip in necessary. The challenge is to untangle the "human knot" without breaking the chain. This represents a change, either natural or un-natural that affects all the connected organisms within a wetland environment.

4. The students should be instructed to work together to un-tangle the human knot without breaking the human chain which forms it. They may step-over, crawl or "limbo" under, lay-down, or sit-on one another, but they may not let-go of hands.

5. Tell the students to be patient with themselves and each other, and work together to solve this puzzle. Giving-up is "knot" an option, so tell them to keep trying. Go from group to group, assisting with "social problems" if any occur, but leave the process up to them. Often small arguments arise, but this is part of the group dynamic process and should be allowed if it is not too severe. Remarks regarding the groups ability or inability to problem solve will usually spur them to pull together. Have groups that finish before others sit quietly and watch. If a group tries and tries but cannot untangle, allow one of the most tangled areas of the group to let-go and re-attach to a more comfortable location.

6. If the whole group really wants a challenge and time is available, try a human knot with the whole large group.

7. Review the experience by pointing-out groups that were successful in untangling, and the positive processes related to this. Explain that these groups represent chains of connected organisms that, when faced with change, were able to adapt and deal with the change in order to survive. The positive group process might represent a flexibility or adaptability among dependent organisms which allows them to be better at coping with problems. Talk about the groups that, no matter how they tried, could not untangle and had to break. These represent linked organisms that, as a dependent chain, could not handle the change or changes that affected them, and therefore one or more of the links were broken. This activity graphically demonstrates the inter-dependence that makes wetland ecosystems so fragile, and will increase understanding of the impact of change on them.

ACTIVITY 6....45 MINUTES
ONE LITTLE, TWO LITTLE, THREE LITTLE MUSKRATS

The muskrat, a common wetland inhabitant, takes the spotlight in this interactive game. Just like other wetland creatures, their numbers are dictated by the availability of habitat requirements : food, water, shelter, and space. Muskrat populations rise and fall, reacting to limits set by the amount of each habitat component. When the ideal muskrat population limit (which we call the Carrying Capacity) is exceeded, the population falls by starvation, disease or other natural means. Low populations rise due to an over-abundance of habitat components. Muskrat trapping can be used as a management tool when populations become "out of balance". This is beneficial to both humans and animals, serving a regulatory and recreation function.

MATERIALS
*Flip-chart or dry marker board.

PROCEDURE
1. Begin by telling students that they are about to participate in an activity that emphasizes the most essential things that animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, and space. These components must be in a suitable arrangement or the habitat will not support a given animal species.

2. Ask your students to count off in four's. Have all the one's go to one area; all the two's, three's, and four's go together to another area. Mark two parallel lines on the ground or floor ten to twenty yards apart. Have the one's line up behind one line; the rest of the students line up behind the other line.

3. The one's become "muskrats". All muskrats need good habitat in order to survive. Ask the students what the essential components of habitat are again: food, water, shelter, and space in a suitable arrangement. For the purposes of this activity, we will assume that the muskrats have enough space in which to live. We are emphasizing food, water, and shelter. The muskrats (the "one's") need to find food, water, and shelter in order to survive. When a muskrat is looking for food, it should clamp its hands over its stomach. Muskrats like to eat young cattail leaves and tender green plants. When it is looking for water, it puts its hands over its mouth. Muskrats need water to drink. They also need open water around their houses that is deep enough to help them elude mink and other predators. When it is looking for shelter, it holds its hands clasped together over its head. Muskrats make homes out of cattail plants, and standing cattails shelter muskrats from the weather. Muskrats choose one of their needs during each round of the activity. A muskrat cannot, however change what it is looking for, when it sees what is available. It can only change what it is looking for in the next round, if it survives.

4. The two's, three's, and four's are food, water, and shelter- components of habitat. Each student gets to choose at the beginning of each round which component he or she will be during that round. The students depict which component the are in the same way the muskrats show what they are looking for; that is, hands on stomach for food, etc.

5. The game starts with all the players lined up back to back with students on their respective lines (muskrats on one side; habitat components on the other side).

6. The facilitator or teacher begins the first round by asking all of the students to make their signs- each muskrat deciding what it is looking for, each habitat component deciding what it is. Give the students a few moments to get their hands in place- over stomachs, mouths, or over their heads. (As you look at the two lines of students, you will normally see a lot of variety- with some students water, some food, some shelter. As the game proceeds, sometimes students confer with each other and all make the same sign. That's okay, although don't encourage it. For example, all the students in the habitat might decide to be shelter. That could represent a drought year with no available food or water.)

7. When you can see that the students are ready, count: "One...two...three". At the count of three, each muskrat and each habitat component turn to face the opposite group, continuing to hold their signs clearly.

8. When muskrats see the habitat component they need, they are to run to it. Each muskrat must hold the sign of what it is looking for until getting to the habitat component person with the same sign. Each muskrat that reaches its necessary habitat component takes the "food", "water", or "shelter" back to the muskrat side of the line. This is to represent the muskrat's successfully meeting it's needs, and successfully reproducing as a result. Any muskrat that fails to find its food, water, or shelter dies and becomes part of the habitat. That is, in the next

round, the muskrat that died is a habitat component and so is available as food, water, or shelter to the muskrats who are still alive. Note: When more than one muskrat reaches a habitat component, the student who gets there first survives. Habitat components stay on their line until a muskrat needs them. If no muskrat needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. The habitat person can, however, change which component it is from round to round.

9. You as the facilitator or teacher record the number of muskrats on a dry-erase board or flip chart in table form at the beginning of the game and at the end of each round (See sample sheet).

10. Continue the game for several more rounds until the muskrat population "booms" and "busts" several times. After a few of these cycles, and when the muskrat population is high, stop the students. Tell the students that the DNR, the Department of Natural Resources, has decided that the muskrat population is "unbalanced" or "out of control". Explain that the DNR is given the job of managing our natural resources, making decisions in the best interests of people and the environment. They have decided that muskrat trapping will stabilize the population, and will allow three trappers to take one muskrat each from the group each round. Choose three people to be trappers (if possible, people who are not involved in the game). Have them stand in between the line of muskrats and the habitat. Give each trapper a hoolahoop, and have them place it on the ground near them. The trappers should face the muskrats, and when the game continues, they should each carefully catch one and have them stand inside their hoolahoop. The rest of the game should continue as before. The "trapped" muskrats die and go to the habitat side each time. The number of "Trapper permits" (TP), or how many muskrats the trappers were allowed to take each round should be recorded on the chart along with the corresponding muskrat population. After a few rounds of this, the game should be ended. Graph the collected data. An example is located on the attached sample sheet.

11. Once the graph is completed, the data can be analyzed. Tell the students that the solid line represents the number or population of muskrats. The "peaks" or points of high population are followed by drastic declines. This indicates that there were too many muskrats for the available habitat to support. The "valleys" or points of low population are followed by rapid population growth. At low populations there is more than enough food, water, and shelter to go around, so the number can increase. The dotted line on the sample graph indicates something called the carrying capacity. This imaginary line represents the ideal number of muskrats that the available habitat can support indefinitely. It could be thought of as the "perfect number" of muskrats for the available habitat. When the muskrat population exceeds this dotted line, muskrats die. When it drops below the "perfect number", more muskrats survive and the numbers rise. This roller coaster effect is guided by natural processes, but is unstable. It should be noted that after trapping is started, the "peaks" and "valleys" of the population fluctuation become less severe, and with some further adjustments in the number of "trapper permits", the population levels out. Discuss that trapping can be used as a "management tool" to benefit both human and wildlife populations.

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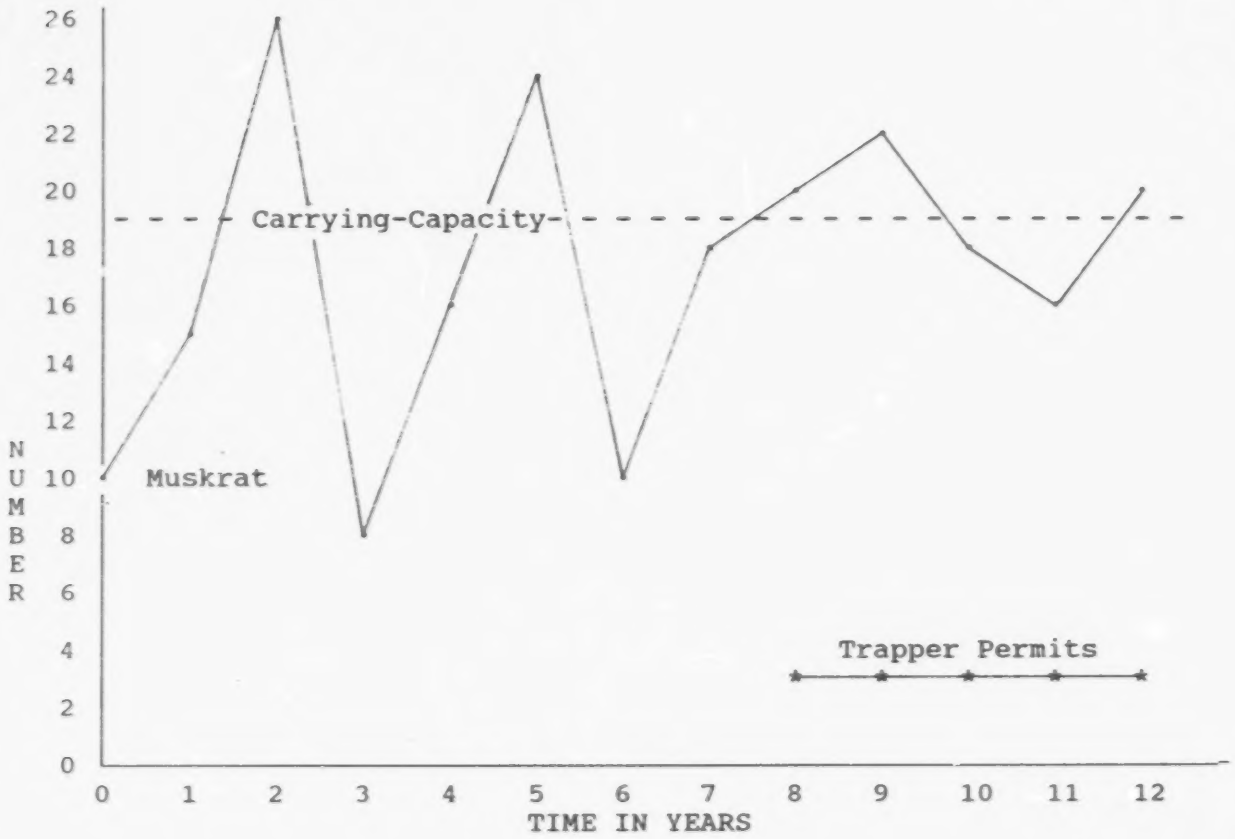
OH MUSKRAT! SAMPLE SHEET

GAME #	MUSKRAT	TRAPPER PERMITS
START	10	0
1	15	0
2	26	0
3	8	0
4	16	0
5	24	0
6	10	0
7	18	0
8	20	3
9	22	3
10	18	3
11	16	3
12	20	3



ACTIVITY 7....45 MINUTES
MARK AND RECAPTURE GAME

Within the State Department of Natural Resources, one of the many positions is that of Game Manager. This position's responsibilities include monitoring and managing wildlife populations. This may involve physical manipulation of either habitat or the animals themselves. Obtaining the necessary information to make sound decisions isn't always as straight forward as one might think. Population estimates, using mathematical formulas are often necessary to "count" wildlife that is constantly moving about. Various Mark and Recapture systems are employed to deal with this difficult task.

MATERIALS

*Dry-Marker board or flip chart.
*Poker chips, colored paper pieces, or some other marker piece (enough for half of the class).
*Recording of Canada geese or goose call.
*If possible, examples of bird band tags.

PROCEDURE

1. Discuss with the class the role of Wildlife Managers within the Department of Natural Resources. Why would they need to know wildlife population size? How does this effect humans?

2. Ask the students how they might find out the number and general health of these animals. The way a Wildlife Manager actually conducts this research in the field is usually determined by the type of animal, its behavior, and type of habitat. For example, aerial surveys are used to estimate the population size of waterfowl, caribou, and antelope. Weight checks and analysis of blood and tissue of deer for parasites can indicate a population's health. Banding (tagging and marking) is a common technique used to observe the migration patterns of geese. Tagging and marking are also used with deer, bear, eagles, and other species of birds, mammals, reptiles, and fish such as trout and salmon. These tags contain vital information about each individual including: date and location of banding, age, sex, and species. When tagged animals are recovered, the information gained can help Wildlife Managers learn a lot about their species as a whole. If possible show the students a real band or tag and include a brief scenario about the animal it came from, and what was learned from it. (Contact your local DNR Wildlife Biologist for examples).

3. After the discussion, take the class outside or to a gymnasium. Set rectangular boundaries for a large playing field (roughly 40x70 feet) In this part of the activity, students will simulate the population census technique of mark and recapture and will collect hypothetical data about a population of geese. Select one of the students to be the "Wildlife Manager", who will be in charge of the census. Tell the students that now you are going to play a game in which they will be Canada geese. Explain that geese often fly in a "V" formation, with a "lead goose" flying at the forward point of the "V". Choose on student to be the lead goose, and inform the students that you will pick a new leader often in the game from among the most well-behaved students. Discuss reasons for the "V" formation. These include geese slip-streaming behind one another for ease of flight, and order necessary for an organized and efficient migration trip. The old joke "Why is one side of a "V" of geese longer than the other.....Because it has more geese in it", often serves to break the ice. Tell students that in order to act like geese they must form a "V" behind the lead goose, flap their wings, and honk like geese. You may want to play a recording, blow a goose call, or simply mimic the call yourself at this point. The call is a "Her-ronk!" with the first syllable (Her) low in pitch and the (ronk) higher in pitch (an octave or so).

4. *Step 1: The Marking.* Have the geese form a "V" behind the lead goose at one end of the playing field. Tell students that they must not go out of the boundaries. They should be facing the field with the point in front like an arrow. Instruct the geese that they are to "fly" (walking slowly) in formation from one end of the field to the other whenever the Wildlife Manager tells them to "migrate". When they reach the other end of the field they should turn around in formation and wait for further instructions. Have them try this once to get the hang of it. After the trial round have the Wildlife Manager stand in the middle of the playing field facing the "V" of geese. Tell the students that the game manager is going to capture a certain number of geese, and that if they are tagged they should come and stand in a group near the teacher/leader. Tell the wildlife manager to capture about half of the class, but not all boys or all girls, the sample must be random. It may take several "migrations" to achieve this. Each "captured goose" should be given a colored piece of paper or other game marker. These students should be instructed to put the marker in their pockets, and not to take it out until instructed to do so at the end of the game. Once half of the class has been captured and given markers, "release" the marked geese and have them re-join the flock. Tell the geese to "break formation" and mix-up so that the marked geese are evenly dispersed in the flock. Choose a new lead

goose, and have the flock form a "V" behind.

5. *Step 2: The Hunt.* Hunters are an important source of information in wildlife research. Tags removed from game are returned to the Fish and Wildlife Service by hunters, providing them with a wealth of information otherwise unavailable. In appreciation for this service, hunters are sent a certificate containing the life information of the tagged animal. In this part of the activity, students will play the role of hunters and provide information to the Wildlife Manager. Copy the information on the "Hunting and Wildlife Management Calculation Sheet onto a Dry-marker board or flip-chart. The wildlife manager should record the information for the following rounds in the correct spaces on this "Data Chart".

Hunt 1- Choose three students to act as hunters, and have them wait in the middle of the field. If the students chosen are "marked geese", have them give their tags to another student. When the hunters are ready, have them tell the flock of geese to "migrate". The process is similar to the "marking" step of the game, but this time hunters are "harvesting" geese. The hunters must harvest a combined total of roughly half the geese in the flock. The number of geese each hunter can harvest is called the daily bag limit. This number is half of the total number of geese divided by the number of hunters. Hunters "harvest" geese by tagging them carefully. Harvested geese go to the sidelines to wait in a group near the Wildlife Manager. Once enough migrations have occurred so that half of the flock has been "harvested", the rest of the flock of "living geese" gathers in a separate group near the "harvested geese". It is important that the two groups don't mix, or the numbers will be affected. Data should be recorded in the appropriate spaces on the Data Chart.

Hunts 2 and 3- Play the game twice more with the entire class. To get new hunters, have the hunters from the previous game choose one of the geese they captured. If any new hunters were marked geese in the previous round, have them give their tags to the hunters that chose them. The rest of the marked geese should keep their tags. Data should be recorded on the Data Chart for both hunts two and three.

6. As a large group, using the collected data, have the students work with the Data Chart to calculate an estimate of the total population. This number should be approximately equal to the size of the class.

7. Discuss the results of the population estimate. Inform the students that an estimate of this kind is only going to be close to the true population. Through formulas like the one used in this activity, Game Managers can gain a fairly accurate picture of wildlife populations. With this knowledge, informed decisions can be made in the best interests of both wildlife and humans.

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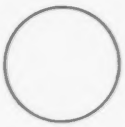
Name:

Mark and Recapture
Data Chart

Place data in the different shapes below and work the equations as shown.

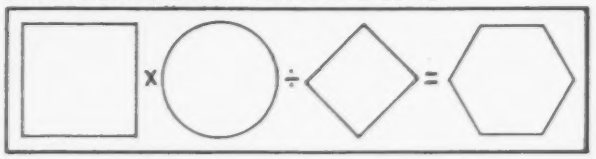
Step 1: The Marking
Total number of "geese" marked:

Step 2: The Hunt
Hunt 1:
Total number of "geese" taken:



Fill in numbers from above and solve:

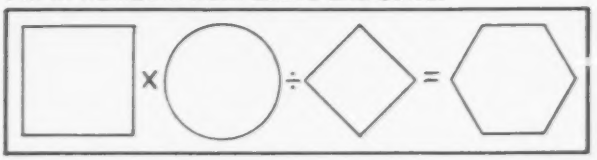
Number of marked "geese" taken:



Hunt 2:
Total number of "geese" taken:

Fill in numbers from above and solve:

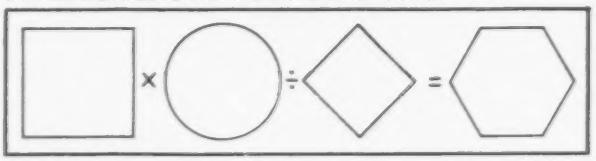
Number of marked "geese" taken:



Hunt 3:
Total number of "geese" taken:

Fill in numbers from above and solve:

Number of marked "geese" taken:



Step 3: The Estimate
To get final population estimate fill in hexagons with answers from above and divide by 3:

Hunt 1 + **Hunt 2** + **Hunt 3** ÷ 3 = **The Estimate**

GLOSSARY

ADAPTATION- A physical or behavioral change in a species in response to demands placed upon it by the environment.

AQUATIC- Having to do with water (i.e. An aquatic organism is a living thing which lives in water).

AQUIFERS- Underground rock caverns which hold groundwater.

BIODIVERSITY- The number of different species present.

BOG- A wetland type characterized by deep, cold water, with a low PH. Bogs can be independent or located on lake margins, and usually contain vegetation that reflects the low ph, low nutrient levels, and cold temperatures (i.e. sphagnum mats, carnivorous plants, thick leaves with a waxy appearance, etc.).

CARRYING CAPACITY- The optimum number of a certain species of organism for a given area.

COMMUNITY- A group of organisms, both plant and animal, connected by inter-relationships and common environmental location.

CONSUMER- An organism which gains energy by eating a producer, another consumer, or a decomposer.

DECOMPOSER- Organisms which fulfill the role of breaking down dead material. This is the largest group of organisms.

ECOSYSTEM- A system formed by the interaction of a community of organisms with their environment.

ENDANGERED SPECIES- A species in danger of extinction throughout all or a significant portion of its range.

ENTOMOLOGY- The study of insects.

EROSION- The process of soil removal by wind or water.

FEN- A wetland type characterized by peat accumulation and drainage from the surrounding countryside. Typically contains plants commonly associated with marshes.

FOOD CHAIN- A section of a food web containing a series of food energy

transfers from plants through several animal levels (i.e. producers-1st level consumers-2nd level consumers...).

FOOD WEB- A complex matrix of interlocking food chains.

GROUNDWATER- Water which has been carried by gravity to the lowest possible point, usually held in underground rock caverns called aquifers.

HABITAT- A suitable arrangement of food, water, shelter, and space to provide for animals' needs.

HYDROLOGY- The study of water movement in a specific area, which is controlled by geology and terrain.

INVERTEBRATE- An organism lacking a vertebral column.

MARSH- A wetland type characterized by shallow water and an abundance of emergent vegetation. Marshes are either located either adjacent to, or within the course of rivers.

NUTRIENT- Organic particles used as food by plants and animals.

ORGANISM- Any form of animal or plant life.

PRAIRIE POTHOLE- A shallow marsh-like pond found in prairie areas.

PRODUCER- Green, photosynthetic plants which gain energy from the sun, and form the first level of energy transfer. This group transforms solar energy into usable form for all successive energy levels (i.e. 1st and 2nd level consumers, decomposers).

RECLAMATION- The act of recovering pre-existing wetlands.

THREATENED SPECIES- A species present in its range, but in danger due to decreasing numbers.

VERTEBRATE- An organism possessing a vertebral column.

WETLAND- An area of land either totally or partially wet or flooded on a regular basis.

WOODED SWAMP- A wetland type characterized by the presence of shrubs and trees adapted to living in wet conditions (i.e.: red-osier dogwood, willow, alder, tamarack, ash, etc.).

WETLAND RESOURCES

BOOKS AND LITERATURE

America's Endangered Wetlands (brochure). U.S. Fish and Wildl. Serv., Federal Bldg., Ft. Snelling, Twin Cities, MN 55111.

America's Wetlands: our link between land and water. 1988. U.S. Environmental Protection Agency. EPA-87-016. EPA Public Information Center, 401 M Street SW, Washington, D.C. 20460.

A Citizen's Guide to Protecting Wetlands. 1989. The National Wildlife Federation. NWF, 1400 16th St., N.W., Washington, D.C. 20036-2266.

Classification of Wetlands and Deepwater Habitats of the United States. Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. U.S. Fish and Wildl. Serv. Off. Biol. Serv. Rep. 79/31.

CLASS PROJECT "Wetlands in Alaska" unit. 1986. Wildlife Federation of Alaska, 750 W. 2nd Ave.- Suite 200, Anchorage, AK 99501.

Conserving our Wetland Resources: Avenues for Citizen Participation. Rice, Barbara, (ed). 1987. Chesapeake Bay Foundation, Suite 815, 1001 East Main St., Richmond, VA 23219.

Ducks at a Distance (i.d. guide). Hines, B. 1978. Outdoor Empire Publ., Inc., P.O. Box C-19000, Seattle, WA 98109.

The Ecology and Management of Wetlands: Vol. 2: Management, Use and Value of Wetlands. Hook D.D., W.H. McKee, et al. (eds). 1988. Timber Press, Portland, OR.

EcoZones Wetlands. Stone, Lynn M. 1989. Vero Beach, FL 32964.

Freshwater Invertebrates of the United states. Pennak, R.W. 1978. 2nd. Ed. Wiley-Interscience, New York.

Freshwater Marshes: Ecology and Wildlife Management. Weller, M.W. 1981. Univ. of Minnesota Press, Minneapolis.

Freshwater Wetlands- A Citizens' Primer. Catskill Center for Conserv. and Develop. Inc. 1978. Hobart, New York.

Freshwater Wetlands: A Guide to Common Indicator Plants of the Northeast. Magee, D.W. 1981. Univ. of Mass. Press, Amherst.

Guide to Wisconsin Aquatic Plants. Education Programs, Bureau of Information and Education, DNR, P.O. Box 7921, Madison, WI 53707.

Homemade Sampling Equipment- Water Quality Series Booklet 2. Tenn. Valley Authority, Clean Water Initiative WT10D-K. 400 West Summit Hill Dr., Knoxville, TN 37902.

Hydrology of Wisconsin Wetlands. Novitzki, R.P. 1982. UW Extension, Geological and Natural History Survey, 3817 Mineral Point Rd., Madison, WI 53705.

An Introduction to Wisconsin Wetlands. Novitski, R.P. 1979. UW-Extension, Geological and Natural History Survey, 3817 Mineral Point Rd., Madison, WI 53705.

Life of the Marsh. Niering, W.A. 1966. McGraw-Hill, New York.

The Life of the Pond. Amos, W.H. 1967. McGraw-Hill, New York.

Of Men and Marshes. Errington, P.L. 1957. MacMillan, New York.

Muskrats and Marsh Management. Errington P.L. 1961. Univ. of Nebraska Lincoln.

My Wetland Coloring Book. U.S. EPA, Region 6, 1445 Ross Ave., Dallas, TX 75202-2733.

National List of Plant Species that Occur in Wetlands: North Central (Region 3). Reed, P.B., Jr. 1988. U.S. Fish and Wildl. Serv. Biol. Rep. 88(26.3).

National Wetlands Newsletter (Quarterly). Environmental Law Inst., Suite 200, 1616 P Street, N.W., Washington, D.C. 20036-2266.

Northern Prairie Wetlands. Van Der Valk, A.(ed). 1989. Iowa State Univ. Press, Ames.

New Field Book of Freshwater Life. Klots, E.B. 1966. Putnam's Sons, New York.

Our National Wetland Heritage: A protection Guidebook. Kusler, J.A. 1983. Environmental Law Inst., 1616 P. Street, N.W. Washington D.C. 20036.

Our Nations Wetlands. 1987. U.S. Government Printing Office 0-329-527.

Our Vital Wetlands. Lake County Water Authority, 107 North Lake Ave. Tavares, FL 32778.

Pond and River. Parker, S. 1988. Eyewitness Books. Knopf, New York.

Pond Life. Bell, P.E. 1977. Opportunities For Learning, Inc. 941 Hickory Lane, P.O. Box 8103, Mansfield, Ohio 44901-8103.

Pond Life. Reid, G.K. 1967. Golden Press, New York.

Prairie Basin Wetlands of the Dakotas: A Community Profile. Kantrud, H.A., G.L. Krapu, and G.A. Swanson. 1989. U.S. Fish and Wildl. Serv. Biol. Rep. 85(7.28).

Protecting America's Wetlands: an Action Agenda. 1989. The Conservation Foundation, 1250 24th St., N.W., Washington, D.C. 20037.

Protecting Our Nations Wetlands and Your Pocketbook (factsheet). EPA, Region V, Office of Public Affairs, 230 S. Dearborn St., Chicago, IL 60604.

Recognizing Wetlands. Army Corps of Engineers, District Office, 1135 U.S. Post Office & Customhouse, St. Paul, MN 55101.

The Swamp. Thomas, B. 1976. Norton & Co., New York.

A Trip to the Pond. Hofmann, Melita. 1966. Doubleday and Co., Inc., Garden City, New York.

Walking the Wetlands: A Hikers Guide to Common Plants and Animals of Marshes, Bogs and Swamps. and Jordan, S. 1989. Wiley Nature Editions, John Wiley & Sons, Inc.

Waterfowl and Wetlands: An Integrated Review. Bookout T.A. (ed) 1979. The Wildlife Society, Madison, WI.

Welcome to the Wetlands (coloring poster). Wetlands Coordinator, Water Division, EPA, Region v, 230 S. Dearborn St., Chicago, IL 60604.

Wetland Creation and Restoration: The Status of Science. Kusler, J.A., and M.E. Kentula (ed). 1990. Island Press, Washington, DC.

Wetland Ecology. Etherington, J.R. 1983. Edward Arnold, London.

Wetland Plants and Plant Communities of Minnesota and Wisconsin. Eggers, S.D. and D.M. Reed. 1987. U.S. Army Corps. of Engineers, St. Paul, MN.

Wetland Protection: Strengthening the role of the States: Proceedings of a National Symposium. Kusler, J.A. and R. Hamann. 1990. Univ. of Florida College of Law, Gainesville.

Wetland Tales: A Collection of Stories for Wetland Education. Publications Office, Dept. of Ecology, P.O. Box 47600, Olympia, WA 98504-7600.

Wetlands Adoption Kit. Izaak Walton League of America, Ste. 1100, 1701 N. Fort Meyer Dr., Arlington, VA 22209.

Wetlands. American Society for Environmental Ed. P.O. Box 800, Hanover, NH 03755-0800.

Wetlands. Mitsch, W.J. and J.G. Gosselink. 1986. Van Nostrand Reinhold, New York.

Wetlands. Niering, W.A. 1985. Knopf, New York.

Wetlands and Water Quality. Paulson, G. 1985. Lake Michigan Federation, 53 W. Jackson Blvd., Chicago, IL 60604.

Wetlands Acquisition and Preservation: A guide for Landowners and Government Officials. McMillan, A. 1986. Dept. of Ecology, State of Washington, Olympia.

Wetlands Are Wonderlands! (poster). EPA Region V, 230 S. Dearborn, Chicago, IL 60604.

Wetlands: Concerns and Successes. Fisk D.W. (ed). 1989. American Water Resources Assoc. Bethesda, MD.

Wetlands Fact Sheet. EPA Wetland Hotline, 800-832-7828.

Wetlands of the United States. Shaw, S.P. and C.G. Fredine. 1956. US Fish and Wildl. Serv. Circ. 39.

Wetlands of the United States: Current Status and Recent Trends. Tiner, Ralph W., Jr. 1984. U.S. Fish and Wildl. Serv., Wetlands Inventory, 1000 N. Glebe Road, Arlington, VA 22201.

Wetlands Protection: A local government handbook. Morris, M. 1991. American Planning Assoc. 1313 East 60th St. Chicago, IL 60637.

Wetlands - The Audubon Society Nature Guides. Neiring, W.A. 1988. Random House, Inc., New York, NY.

Wetlands Values and Management. Wentz, W.A. 1981. US Fish and Wildl. Serv. and EPA.

Wetlands Watch Kit. Izaak Walton League of America. 1988. 1401 Wilson Blvd., Level B, Arlington, VA 22209.

Wetlands, Wildlife, and You! Iowa State Univ. Extension, Ames, IA 50011.

Who Lives in Mud? (poster). National Science Teachers Assoc., 1742 Connecticut Ave. N.W., Washington, DC 20009.

Wonders of the Pond. Sabin, Francene. 1982. Troll Associates, Mahwah, NJ.

TEACHING GUIDES AND CURRICULUM

A Curriculum Guide For Wetland Education. Centers for Nature Education, Inc. P.O. Box 133, 4007 Bishop Hill Rd., Marcellus, New York 13108.

Aquatic Project WILD Education Guide. Project WILD, DNR, P.O. Box 7921, Madison, WI 53707.

Nature Scope: Wading Into Wetlands. National Wildlife Federation. 1986. 1400 16th Street, N.W. Washington, D.C. 20036-2266.

Wading into Wetlands. NatureScope, National Wildl. Fed., 1412 16th St. N.W. Washington, DC 20036-2266.

Wetland Ecology and Management. Illinois Dept. of Conservation, Communications Prog., Div. of Forest Resources and Natural Heritage, 524 S. 2nd St., Springfield, IL 62706.

Wetland Pacs. National Inst. for Urban Wildlife, 10921 Trotting Ridge Way, Columbia, MD 21044.

WETLANDS Affect You and Me. The Wetlands Team of the Michigan DNR. 4-H Youth Programs, Cooperative Extension Service, Michigan State Univ.

Wetlands and Wildlife: Alaska Wildlife Curriculum. Alaska Dept. of Fish and Game, Division of Wildlife Conservation, P.O. Box 3-2000, Juneau, Alaska 99802-2000.

Wetlands Are Wonderlands. Chris Pennisi, Illinois/Indiana Sea Grant Program, Univ. of Illinois, 65 Mumford Hall, 1301 W. Gregory Drive, Urbana IL 61801.

WETLANDS Leader/Teacher Guide. George, R.W. 4-H Youth Programs, Cooperative Extension Service, Michigan State Univ.

WETNET: An Environmental Curriculum Dealing with Wetlands. Partnerships for an environmentally sound future, P.O. Box 3000, Paul Smiths, NY 12970.

Why Wetlands? Federation of Ontario Naturalists, 355 Lesmill Rd., Don Mills, Ontario, M3B 2W8, Canada.

WILD About Wetlands! Project WILD, DNR, P.O. Box 7921, Madison, WI 53707.

WOW!: The Wonders of Wetlands (an educators guide). Slattery, B.E. 1991. Environmental Concern Inc. P.O. Box P, St. Michaels, MD 21663.

VIDEOS, FILMS, AND A/V RESOURCES

Americas Wetlands (28 min.). Rental from: Conservation Film Service, P.O. Box 776, 408 E. Main St., League City, TX 77573.

Conserving America: Wetlands (film). National Wildl. Fed., 1412 16th St. N.W. Washington, DC 20036-2266.

Freshwater Wetlands Mitigation (17 min.). Dept. of Transportation, 125 Main St., Buffalo, NY.

The Marsh Community: Our Vanishing Marshland (film or video). Encyclopedia Britannica Educational Corp., 425 N. Michigan Ave., Chicago, IL 60611.

Romp in the Swamp (record or cassette). Brennen, Bill. Do Dreams Music, P.O. Box 5623, Takoma Park, MD 20912.

Understanding Wetlands (10 min.). Michigan DNR, Box 30034, Lansing, MI 48909.

Wetlands: Our Natural Partners in Wastewater Treatment (38 min.). Rental from: Conservation Film Service, P.O. Box 776, 408 E. Main St., League City, TX 77573.

Wetlands-The Land and Water Connection - 12 min. slide/tape. UW County extension Offices.

Wetland Wildflowers (filmstrip). Michigan DNR, Box 30034, Lansing, MI 48909.

Why Wetlands? (30 min. video). Federation of Ontario Naturalists, 355 Lesmill Rd., Don Mills, Ontario, M3B 2W8, Canada.

OUTDOOR OPPORTUNITIES AVAILABLE FROM THE OUTDOOR SKILLS CENTER

The Outdoor Skills Center has three seasonal program choices available for your upper elementary and middle school youth. The educational objectives for each grade level are similar, but the activities are tailored to the appropriate cognitive, affective, and psychomotor level. Each program will utilize a field experience to help build an understanding of the environment and problems it faces. Pre- and post-trip activities provided for your teachers will link the natural world with actions students can take to resolve its problems. As students paddle a canoe through dense stands of cattails, follow a mink track in fresh snow, or discover the living world inside a decaying log, they will take part in experiences that will be remembered for a life time. The lessons they learn will serve as a reference for further actions.

FALL & SPRING..."DISCOVER THE SHEBOYGAN MARSH" RECOMMENDED FOR 5TH - 8TH GRADE

Wetlands serve a variety of important functions including ground water recharge, flood control, silt/pollution filtration, wildlife habitat, and recreation. Yet in Wisconsin over 70% of pre-statehood wetlands have been destroyed. The "Discover the Sheboygan Marsh" program examines the issue of wetland preservation by providing experiences that develop an understanding of their values.

Hands on Discovery.

Students survey the diversity of life that exists in the marsh and discover the non-living parts of the environment that support life. Through hands-on activities students pass through the marsh food chain and discover adaptations that plants and animals have developed to survive. Passing through geological time, students learn how the marsh has aged since its birth 10,000 years ago and discover how humans have accelerated this process. Playing the role of ducks, students experience how the loss of wetland habitat has severely reduced waterfowl populations and learn how organizations are solving this problem. Back at school, students will explore all functions of wetlands, brainstorm solutions to wetland loss, and participate in the political process through participation in a mock town hearing.

Measuring the Severity of Winter.

WINTER...."WINTER ECOLOGY: A QUESTION OF SURVIVAL" RECOMMENDED FOR 4TH-7TH GRADE

Winter is a harsh season in Wisconsin. For organisms to survive the rigors of winter they must have many tricks up their sleeves. In response to these demands plants and animals have developed a variety of adaptations that insure their survival through this ruthless period. Not everything "dies or runs away" during this deceptively quiet season. Organisms take on a "new way of being" to meet the changing demands of survival. As residents of the planet earth, we too are called to adapt in the rhythm of the seasons, and the changing world in which we live.

Students participating in "Winter Ecology: A Question of Survival" will observe and measure the winter environment, survey life above and under the ice and snow, discover the ways organisms survive, and develop skills that humans would need to survive under similar conditions. A variety of indoor and outdoor activities will be utilized during the day to insure a comfortable educational atmosphere.

LATE FALL/EARLY SPRING...."SEEING OUR FORESTS BEYOND THE TREES: A LOOK AT OUR FOREST RESOURCES" RECOMMENDED FOR 5TH - 8TH GRADE

Forests serve a variety of important functions. Not only do they provide lumber for construction, firewood, and paper fiber, but also control erosion, transform carbon dioxide from your car to oxygen, and provide habitat for many species of wildlife. They are a diverse

Determining the Board Feet in a Tree.

ecosystem of interdependent living and nonliving entities. The future of local, national, and world forests are currently major issues affecting us all.

Locally, woodlands have been reduced over time to rough, nonfarmable areas. Development in these areas threaten the very character of our woodlands. Nationally, the question of preserving endangered species has shut down a major industry. Globally, the rain forests that contain over 75% of the worlds species and that produce a large percentage of the earths atmospheric oxygen are being destroyed for agricultural purposes.

"SEEING OUR FORESTS BEYOND THE TREES: A LOOK AT OUR FOREST RESOURCES" examines the issue of forest use vs. wise use vs. preservation. The program will look beyond the trees to see the values of our forests. Participants will unearth the fragile nature of forest soils, explore differences in existing forest communities, and discover the roles organisms play within this ecosystem. Plotting compass courses and measuring timber stands, participants will learn skills used by forest management professionals. Back in the classroom students will examine the aesthetic, biologic, social, and economic values of forests; through a public hearing role play they will learn how future management will affect humans in a variety of different ways.

OUR SCHOOL PROGRAMS ARE BASED OUT OF A RENOVATED SEMI-TRAILER

Thanks to the generosity of program supporters, we have the flexibility to make all our offerings "on-site programs". Our experiences are based out of a mobile laboratory. As students pass through either door, they enter a well lit, comfortable atmosphere. On the counters running down each side of the trailer are microscopes, water test kits and tools necessary for exploration. In cabinets above and below the counters are miscellaneous equipment and supplies; displays and bulletin boards attract student eyes. Regardless of the weather outside, the lab enhances student learning of ecological principles by providing a laboratory setting in the field. The Outdoor Skills Center has the only mobile facility of its kind in Wisconsin.

ECO-Lab...Warm and Comfortable Inside.

NEW IN 1995...CLASSROOM PROGRAMS

Looking for experiential programs for the classroom? Give the Outdoor Skills Center a call. We have an exciting new menu to choose from. Our staff will bring a fun-filled, informative program to you. Each program lasts approximately one hour.

Choose from one of the following:

Those beautiful bats: Are bats beneficial or dangerous? We will explore the world of bats with the program being taught by Dracula himself. Myths, misconceptions and story tales will be discussed. Discover how beneficial bats really are. Find out what your class can do to help bats.

Timber Wolves: Have you heard the one about the "Big Bad Wolf?" Nothing could be further from the truth. Learn how wolves have been hated over the years and how few remain in Wisconsin. Discover what wolves eat, their pack structure, and why they howl. A wolf pelt will be available for all to see and feel.

Goodness Gracious Snakes Alive: Are snakes cold and slimy? Find out. We will talk about snakes and how they survive and adapt to the changing seasons in Wisconsin. A real, live snake will join us.

Tadpoles and Frog Songs: (seasonal) How do frogs survive through the winter? Discover what they eat and where they live. We will look at different sizes, colors, listen to frog songs, look at their life cycle and examine how they indicate environmental pollution.

Critters of the Deep: Ever really look at a pond? There is much more than meets the eye. Your students will go on a micro safari in water samples we will bring to your classroom. Discover a whole new world you've overlooked.

Lonesome Charlie Reynolds - Buffalo Hunter Extraordinaire: "Home, home on the range. Where the buffalo use to roam." In a mere few decades the thundering herds of buffalo were almost eliminated by buffalo hunters. Charlie will recount those years in your classroom. Learn how greed affected this mighty beast and all that depended upon it.

Who Hoots at You?: Owls are fascinating creatures of the night. You will learn how they have adapted to nighttime hunting and what critters they eat.

Jean Claude - The Last Voyageur: Have you ever met a real live voyageur? You will when Jean Claude visits your class to talk about fur trading in the 1700's in Wisconsin. Jean comes dressed in buckskins and wool with furs for the kids to see and feel.

Haywire Tom Watson - The Climbing Lumberjack: How did Wisconsin become the state we see today? Lumberjacks had a large influence on our history. Meet Haywire Tom Watson, lumberjack sawyer as he tells how it was in the logging camps and shows some of the tools he used. Students will also get to cut into a log with a real crosscut saw.

Busy Beavers: Have any of your students dressed up like a beaver? One of them will today as we will talk about beaver adaptations, how they live, what they eat, and how they shaped the history of Wisconsin.

Animal Sleuths - "Who Done It?": Have you ever seen a track and wondered what animal made it? Students will work as detectives to uncover evidence left behind by various animals.

Finding the Way Home - Compass Skills: Have you ever been lost in the woods? Let us turn your classroom into a remote wilderness. Learn to use a compass and find your way back to civilization.

Washing it Down the Drain: How have you used water today? We will discuss the many uses of water, look at water contamination through a hands on experience, consider water reduction practices and find out how the students can be a part of the solution to stop water pollution.

Hunters of the Sky: Are all hawks the same size and color? Find out. We will look at various hawks and how they have adapted to fit into their own individual part of the ecosystem.

Tree Detectives: How can you tell one type of tree from another? Learn the tricks needed to differentiate trees and discover how to use a dichotomous key. Younger children will take part in tree games to learn tree I.D.

WHO IS THE OUTDOOR SKILL CENTER?

The Outdoor Skills Center is a non-profit organization that provides youth and families outdoor recreation and environmental education opportunities. Operations are based in a log cabin on the Sheboygan County Fairgrounds in Plymouth. Programming is available for schools, youth organizations, corporations, and the general public. The Outdoor Skills Center program is the result of a two year feasibility study conducted in Sheboygan County by the University of Wisconsin--Stevens Point. Funding for the program's development was made available through the Sheboygan County Conservation Association, the National Izaak Walton League Endowment, the WI DNR, the WI DPI, the WI Coastal Management Council, the County of Sheboygan, and local foundations, businesses, and individuals.

OUTDOOR SKILLS CENTER STAFF

The Outdoor Skills Center has competent, qualified staff members that will make your student's visit to the outdoors a special experience.

STERLING STRATHE
Sterling has been with the program since 1989. As a graduate student at UWSP, he did the feasibility study of Sheboygan County and wrote an operational master plan for the center. Sterling has an MS in Natural Resources with an emphasis in environmental education, teaching certification in biology and general science, and a BS in fisheries and wildlife biology. He brings with him a wealth of life experiences in the outdoor education field and in the private sector as a farm/ranch manager. This mixture of experiences provides Sterling with an overall understanding of all sides to an environmental issue.

AMY BROWN
Amy has been with the program since fall of 1992. Amy has a BS from UW-Oshkosh in secondary education, with teaching certification in earth science and health education. Her classroom and field experiences compliment our program. Amy has a genuine love for the outdoors and is enthusiastic in sharing her knowledge and expertise with others.

SCOTT JOHNSON
Scott Johnson is the newest member of the OSC team, and has been with us since October, 1994. He has a BS in Forestry from UW-Stevens Point, with minors in Land Use Planning and Resource Management. Scott's past experiences include working as the naturalist at Pattison State Park, presenting nature programs for the city of Janesville, and also teaching at Trees For Tomorrow Outdoor Education Camp in Eagle River, WI. His wide range of interests, knowledge and skills add to the diversity of our programs.